CEQA PRELIMINARY DRAINAGE STUDY

Case Nos. MUP04-056, ER 04-21-004

St Adelaide Church
Campo

Prepared By:

Cherry Engineering
12721 Poway Road
Poway, CA. 92064

For:

St. Adelaide Catholic Church
Sheridan Road
Campo, Ca.

November 10, 2005

Albert L Cherry

11-10-05

Albert L. Cherry R.C.E. 37980 Date
Reg. Exp. 3/31/07

Purpose – This preliminary hydrology/hydraulics study was prepared to determine the impacts of a 100-year storm event on the existing site, the proposed site and surrounding area.

Existing Condition – The church property is a 5.2-acre piece of land located at the northeast corner of Sheridan and Custer Roads in the Cameron Corners area of Campo. The mostly unimproved site is zoned RR-1 and was part of the historical Camp Lockett army base active during WWII. There are remnants of concrete slabs and footings from previous camp improvements. According to FEMA flood maps the site is not within a 100-year flood zone.

The site drains to the west toward Sheridan Road. A 36-inch storm drain collects runoff from the east and conveys it to the west of Sheridan Road. The onsite soils are representative of La Posta rocky loamy coarse sands (Hydrologic Soil Group A). Expected saturated infiltration rates for this mix of soils are on the order of 6 to 20 in/h. The county assigns a runoff coefficient of 0.20 for unimproved Type A soils. Runon from offsite areas are a mix of Types A & B soils.

A summary of the 100-year storm runoff from the existing site is tabulated below. Water quality flows (Qwq) are calculated using the 85th percentile isopluvial for the site. The Q for the existing 36-inch storm drain is for the entire watershed; the Q for Sheridan Road is site only.

Location	Acres	Q100	Qwq	Velocity
Sheridan Road (site)	5.2	6.7	1.7	
Existing 36" Storm Drain	87.6	96.3		23.7 fps

Upstream and Downstream Conditions – The site accepts runoff from the east. 200-scale topographic maps identify an easterly watershed of about 60-acres. The upstream runoff is conveyed through the site in a shallow drainage swale and enters the Sheridan Road storm drain system. The 36-inch storm drain and catch basin convey the runoff to the west side of the road and into a concrete lined drainage ditch. From the west side of Sheridan Road surface runoff ultimately enters Campo Creek and flows southerly into Mexico near Canyon City. The creek eventually joins the Tijuana River which outlets into the Pacific Ocean.

Proposed Construction – The proposed improvements include a 5,700 square foot multipurpose building, a 5,300 square foot sanctuary building, and a 12,000 square foot education building. Exterior improvements include 52,000 square feet of asphalt parking area and 20,000 square feet of concrete pavement and hardscape with associated landscaping. Total site area is 5.2 acres.

The improvements will change the character of the land from a mostly pervious site to a 44% impervious site. The impervious surfaces include buildings, hardscapes and pavements.

A 30-inch storm drain will convey the easterly runoff through the site. In order to avoid offsite excavation a large sump area will be created for the inlet structure onsite. The sump will be lined with riprap to protect the 2:1 sides from erosion. Brow ditches will direct peripheral runoff to the sump. The approximate dimensions of the sump are 70'Lx20'Wx9'H.

A series of catch basins and piping will collect local runoff and convey it to the 30-inch pipe. The 30-inch pipe will connect to an existing catch basin in Sheridan Road. The existing 36-inch storm drain across Sheridan Road is adequate to convey the 100-year flows for the area. Normal depth calculations indicated a capacity of 160 cfs.

Runoff in the north parking area will be collected in a curb inlet and piped to a detention area in the northwest corner of the site. The detention basin will reduce the effect of the increase in site runoff by accommodating all the parking lot flow.

Surrounding area runoff will be diverted around the site with concrete ditches.

Results Of The Drainage Study

The total 100-year runoff for the improved site is 16.1 cfs. With the detention basin the parking lot area runoff that is directed into the basin can be removed from the total flow.

A summary of the 100-year storm runoff for the proposed site is tabulated below.

Location	Acres	Q100	Qwq	V fps	
Sheridan Road	5.2	16.1	3.2		Without detention basin
Detention Basin	.11	(7.4)			
Total Site	5.2	8.7			With detention basin
Existing 36-inch	87.6	106		24.2	Without detention basin
Existing 36-inch	87.6	98.6		24	With detention basin

A vertical standpipe will be used as overflow for the detention basin.

Velocities and Erosion

Based on site inspection and topography erosive velocities currently do not occur at the site. Due to the upstream watershed passing through the site a minor drainage channel is evident. Representative grades onsite are about 20%. The downstream area westerly of Sheridan Road looks very similar to this site; the existing 36-inch storm drain outlets into a concrete lined drainage ditch that conveys runoff to the west toward Campo Creek.

Under the proposed condition upstream runoff will be collected in a 30-inch storm drain and passed through the site. No erosive velocities are expected under the proposed

improvements. Landscaping will prevent erosion on slope surfaces. The pre and post construction velocities for the existing 36-inch remain virtually unchanged at about 24 fps. As the ditch is concrete lined no erosion is expected.

Project Impacts

The proposed project will increased impervious surfaces and generate an increase in runoff for the site. A detention basin is proposed that will help mitigate the increase in runoff. The net increase in runoff for the site is estimated at 2.0 cfs (8.7 – 6.7).

100 Year Storm Impacts

The site in not within a mapped FEMA study area. The nearest study area is Campo Creek downstream from the site. According to FIRM No. 06073C2300F the site is in a Zone X area with minimum to moderate flood damage expected. Zone X areas do not require flood insurance.

The site is within the County's Zone 4 Comprehensive Plan for Flood Control and Drainage. The study was prepared in August 1975 and identifies recommended drainage improvements to Forest Gate Road starting at Highway 94 and extending upstream. Flooding of area streets and buildings is described as the present condition. Assuming the study recommendations were not constructed flooding of the southerly access roads to the site will occur during a significant storm event. The site is in the northerly fringe of the study area and about 40 feet above the area of expected inundation. It is expected that access to the site from the north along public Sheridan Road will remain open during flood occurrences.

As the offsite runoff will be intercepted and carried underground within the 30-inch storm drain no 100 year inundation zones will occur onsite. The capacity of the existing downstream storm drain system will not be exceeded as result of this project.

In the event failure of the 30-inch storm drain occurred (blockage) the easterly offsite runoff would spill into the parking lot and sheet flow away from the proposed structures.

The project does not create or contribute runoff which would exceed the capacity of existing storm drain system.

The project does not place within a 100-year flood hazard area structures which would impede or redirect flood flows.

The project does not expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam on-site or off-site.

Downstream Ditch Capacity

The capacity of the downstream ditch is estimated at 116 cfs. The estimate is based on a normal depth calculation using a roughness coefficient of 0.045, a bottom width of 2 feet, side walls of 2:1, and a depth of 3 feet. The post construction runoff is estimated at 98.6 cfs which is an increase of 2.5 cfs over the estimated preconstruction runoff. A negligible increase in water surface elevation may be realized downstream.

Brow Ditch Capacities

The capacities of the perimeter brow ditches were determined using normal depth calculations. The approximate slopes for the ditches were obtained from the site topographic survey.

	Slope	Capacity	Q100
North Brow Ditch	6%	24cfs	12.8cfs
South Brow Ditch	2%	14cfs	19.3cfs
East Brow Ditch (flowing north)	7%	26cfs	70.5cfs
East Brow Ditch (flowing south)	5%	22cfs	70.5cfs

As only a portion of the Q100 runoff being diverted from the site will be carried in any ditch they appear more than adequate to serve the site. The majority of the 70.5 cfs runoff from the east will be conveyed in the defined upstream channel, not the ditches.

Mitigation Measures

- A detention basin will help reduce increase in runoff.
- An energy dissipator (riprap) will slow runoff flows entering the site from the east and protect the slope from erosion.
- All slopes will be planted or hydroseeded.

BASIS FOR HYDROLOGY CALCULATIONS

DESIGN METHOD:

The San Diego County Hydrology Manual (June 2003) was used as the basis for the hydrology calculations.

RUNOFF COEFFICIENT – **C**:

The project site is zoned RR-2, Rural Residential. The soil type is Group 'A' soils per Natural Resources Conservation Services Maps. The site is indicated on the attached hydrologic soil group map. Table 3-1 of the Hydrology Manual assigns a runoff coefficient of 0.20 for open space Type 'A' soils and 0.27 for low-density residential developments.

For the proposed project, runoff coefficients were assigned by the percent of impervious areas within the drainage area under consideration.

STORM FREQUENCY/INTENSITY – **I**:

As directed by the County the design storm frequency is 100-year. Figure 3-2 of the Hydrology Manual was used in conjunction with the 100-year 6-hour and 24-hour isopluvial maps in Appendix B. P_6 = 3.0-inches; P_{24} = 5.7-inches.

TIME OF CONCENTRATION – Tc:

The time of concentration for initial areas was determined using the maximum overland flow length per Table 3-2 of the hydrology manual. The initial time of concentration was obtained using Figure 3-3. Where distances for initial areas were greater than those listed in Figure 3-3 the Kirpich formula was used to determine the time for the remaining distance and the time was added to the initial time of concentration. The time of concentration between nodes is calculated using Manning's equation for pipes.

DRAINAGE BASIN AREA – **A**:

The drainage basin areas, in acres, are indicated on the enclosed drainage area maps. 200 scale county topo maps are included for offsite watershed areas.

HYDROLOGIC CALCULATIONS

Computer generated calculations for the 100-year runoff flows are included with this study.

I hereby declare that I am the civil engineer of work for this report, that I have exercised responsible charge over the preparation of this report as defined in section 6703 of the business and professions code, and that the design is consistent with current standards.

I understand that the check of project reports and calculations by the County of San Diego is confined to review only and does not relieve me, as engineer of work, of my responsibilities for project design.

_____

ALBERT L. CHERRY RCE 37980 DATE
Reg. Exp. 3/31/07

CHERRY ENGINEERING
12721 Poway Road, Poway, CA 92064
Ph (858) 679-3410 Fax (858) 679-3416

Project ST. ADELAIDE CHURCH
Date 11-19-04
Designed By ALC
Sheet 1 of 1

Subject WATER QUALITY FLOWS (85TH PERCENTILE)

PRECONSTRUCTION CONDITIONS

85TH PERCENTILE ISOPLUVIAL FOR SITE IS 0.75 = (P)

CALCULATE RAINFALL INTENSITY FOR SITE. $\left(I = 7.44(P)T_c^{-0.645}\right)$

$Q = C I_{85} A$ $\quad C = 0.27$

$T_c = 10.92$ MIN $\quad I = 7.44(.75)10.92^{-0.645} = 1.19$ IN/HR

$Q = .27(1.19)5.2 = \underline{1.7\ CFS}$

POST CONSTRUCTION CONDITIONS

$C = 0.53$ (WEIGHTED C)

$T_c = 11.37$

$I = 7.44(.75)11.37^{-0.645} = 1.16$

$Q = .53(1.16)5.2 = \underline{3.2\ CFS}$

CHERRY ENGINEERING
12721 Poway Road, Poway, CA 92064
Ph (858) 679-3410 Fax (858) 679-3416

Project ST ADELAIDE CHURCH

Date 4.27.05

Designed By ALC

Subject DETENTION BASIN DESIGN

Sheet 1 of 1

AREA IS AVAILABLE ONSITE FOR A SMALL DETENTION BASIN IN THE NORTHWEST CORNER OF THE SITE. THE PARKING AREA RUNOFF CAN BE DIRECTED INTO THE BASIN TO OFFSET INCREASED RUNOFF DUE TO THE PROPOSED IMPERVIOUS SURFACES.

AREA OF PARKING LOT DRAINING TO DETENTION BASIN IS 1.2 AC. VOLUME OF RUNOFF GENERATED IS ESTIMATED USING EQ. $V = CP_6A$

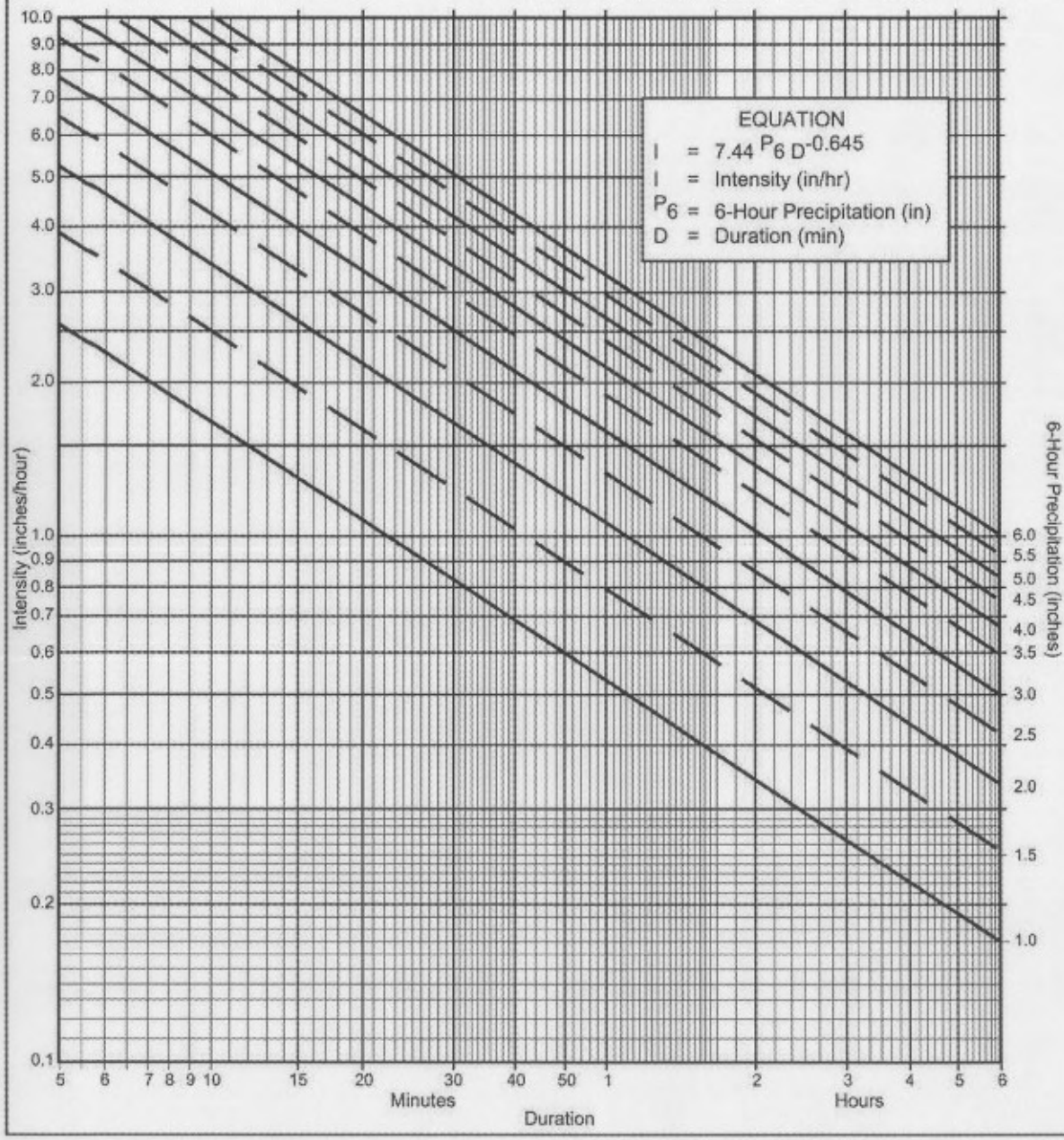
$C = 0.83$
$P_6 = 3$ IN
$A = 1.2$

$VOL = .83(3)1.2 = 3$ ACRE-INCHES OR 0.25 AC-FT.

DETENTION AREA = 4500 SF ≈ .11 AC } 0.30 AC-FT.
DETENTION DEPTH = 3 FT.

* USING A DETENTION BASIN WOULD MITIGATE EFFECT OF IMPERVIOUS PARKING LOT. PROPOSED CONDITION RUNOFF FOR PARKING LOT AREA TO BE ELIMINATED FROM COMPARISON.

PRE CONDITION 100-YEAR FOR SITE = 6.7 CFS
POST CONDITION 100-YEAR FOR SITE = 16.1 - 7.4 = 8.7 CFS



Directions for Application:

(1) From precipitation maps determine 6 hr and 24 hr amounts for the selected frequency. These maps are included in the County Hydrology Manual (10, 50, and 100 yr maps included in the Design and Procedure Manual).

(2) Adjust 6 hr precipitation (if necessary) so that it is within the range of 45% to 65% of the 24 hr precipitation (not applicaple to Desert).

(3) Plot 6 hr precipitation on the right side of the chart.

(4) Draw a line through the point parallel to the plotted lines.

(5) This line is the intensity-duration curve for the location being analyzed.

Application Form:

(a) Selected frequency _____ year

(b) P_6 = 3.0 in., P_{24} = 5.7, $\frac{P_6}{P_{24}}$ = 53 %(2)

(c) Adjusted P_6(2) = 3.0 in.

(d) t_x = _____ min.

(e) I = _____ in./hr.

Note: This chart replaces the Intensity-Duration-Frequency curves used since 1965.

P6	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6
Duration	I	I	I	I	I	I	I	I	I	I	I
5	2.63	3.95	5.27	6.59	7.90	9.22	10.54	11.86	13.17	14.49	15.81
7	2.12	3.18	4.24	5.30	6.36	7.42	8.48	9.54	10.60	11.66	12.72
10	1.68	2.53	3.37	4.21	5.05	5.90	6.74	7.58	8.42	9.27	10.11
15	1.30	1.95	2.59	3.24	3.89	4.54	5.19	5.84	6.49	7.13	7.78
20	1.08	1.62	2.15	2.69	3.23	3.77	4.31	4.85	5.39	5.93	6.46
25	0.93	1.40	1.87	2.33	2.80	3.27	3.73	4.20	4.67	5.13	5.60
30	0.83	1.24	1.66	2.07	2.49	2.90	3.32	3.73	4.15	4.56	4.98
40	0.69	1.03	1.38	1.72	2.07	2.41	2.76	3.10	3.45	3.79	4.13
50	0.60	0.90	1.19	1.49	1.79	2.09	2.39	2.69	2.98	3.28	3.58
60	0.53	0.80	1.06	1.33	1.59	1.86	2.12	2.39	2.65	2.92	3.18
90	0.41	0.61	0.82	1.02	1.23	1.43	1.63	1.84	2.04	2.25	2.45
120	0.34	0.51	0.68	0.85	1.02	1.19	1.36	1.53	1.70	1.87	2.04
150	0.29	0.44	0.59	0.73	0.88	1.03	1.18	1.32	1.47	1.62	1.76
180	0.26	0.39	0.52	0.65	0.78	0.91	1.04	1.18	1.31	1.44	1.57
240	0.22	0.33	0.43	0.54	0.65	0.76	0.87	0.98	1.08	1.19	1.30
300	0.19	0.28	0.38	0.47	0.56	0.66	0.75	0.85	0.94	1.03	1.13
360	0.17	0.25	0.33	0.42	0.50	0.58	0.67	0.75	0.84	0.92	1.00

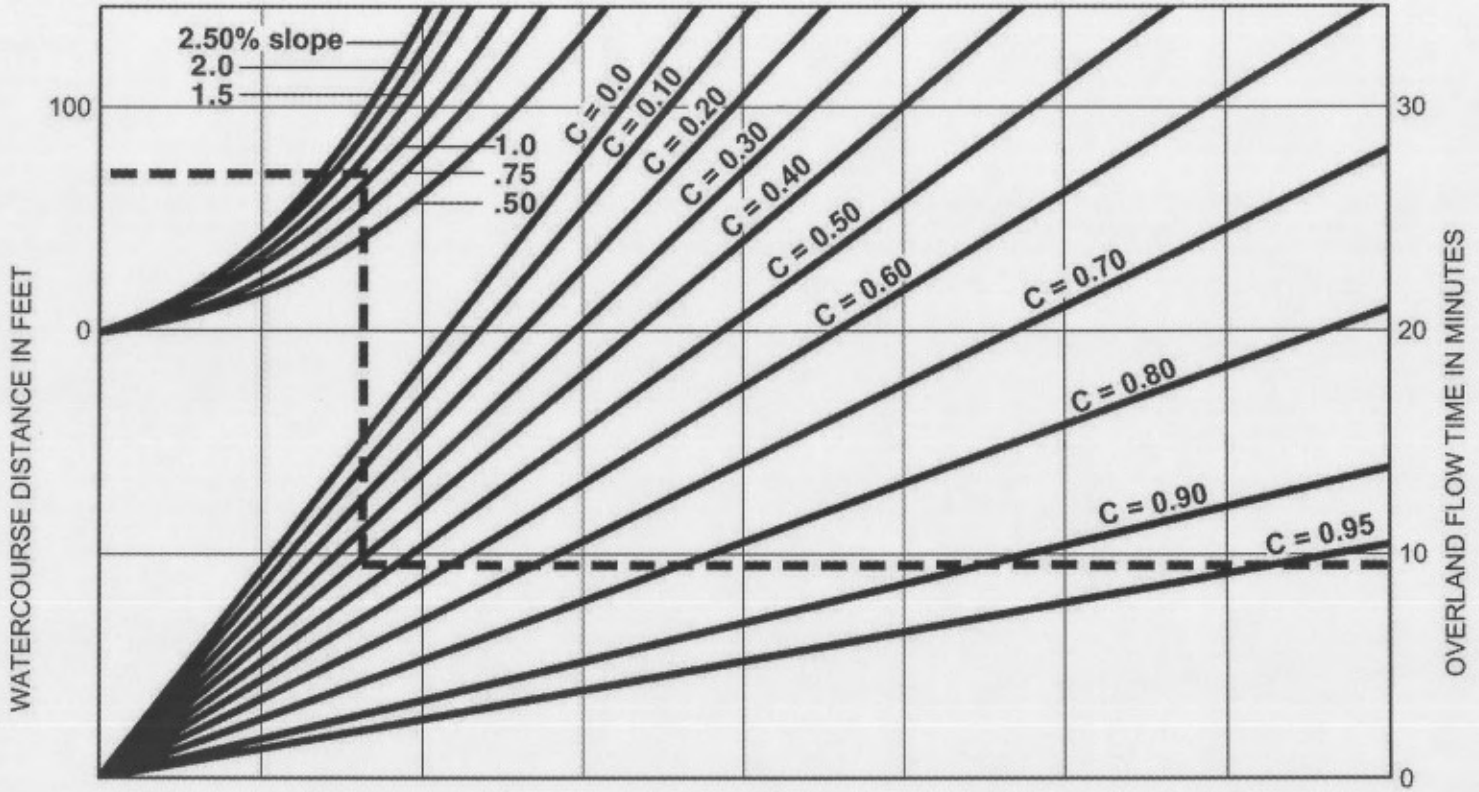
Intensity-Duration Design Chart - Template

FIGURE 3-1

Table 3-1
RUNOFF COEFFICIENTS FOR URBAN AREAS

Land Use		Runoff Coefficient "C"				
			Soil Type			
NRCS Elements	County Elements	% IMPER.	A	B	C	D
Undisturbed Natural Terrain (Natural)	Permanent Open Space	0*	0.20	0.25	0.30	0.35
Low Density Residential (LDR)	Residential, 1.0 DU/A or less	10	0.27	0.32	0.36	0.41
Low Density Residential (LDR)	Residential, 2.0 DU/A or less	20	0.34	0.38	0.42	0.46
Low Density Residential (LDR)	Residential, 2.9 DU/A or less	25	0.38	0.41	0.45	0.49
Medium Density Residential (MDR)	Residential, 4.3 DU/A or less	30	0.41	0.45	0.48	0.52
Medium Density Residential (MDR)	Residential, 7.3 DU/A or less	40	0.48	0.51	0.54	0.57
Medium Density Residential (MDR)	Residential, 10.9 DU/A or less	45	0.52	0.54	0.57	0.60
Medium Density Residential (MDR)	Residential, 14.5 DU/A or less	50	0.55	0.58	0.60	0.63
High Density Residential (HDR)	Residential, 24.0 DU/A or less	65	0.66	0.67	0.69	0.71
High Density Residential (HDR)	Residential, 43.0 DU/A or less	80	0.76	0.77	0.78	0.79
Commercial/Industrial (N. Com)	Neighborhood Commercial	80	0.76	0.77	0.78	0.79
Commercial/Industrial (G. Com)	General Commercial	85	0.80	0.80	0.81	0.82
Commercial/Industrial (O.P. Com)	Office Professional/Commercial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (Limited I.)	Limited Industrial	90	0.83	0.84	0.84	0.85
Commercial/Industrial (General I.)	General Industrial	95	0.87	0.87	0.87	0.87

*The values associated with 0% impervious may be used for direct calculation of the runoff coefficient as described in Section 3.1.2 (representing the pervious runoff coefficient, Cp, for the soil type), or for areas that will remain undisturbed in perpetuity. Justification must be given that the area will remain natural forever (e.g., the area is located in Cleveland National Forest).
DU/A = dwelling units per acre
NRCS = National Resources Conservation Service



EXAMPLE:

Given: Watercourse Distance (D) = 70 Feet
Slope (s) = 1.3%
Runoff Coefficient (C) = 0.41
Overland Flow Time (T) = 9.5 Minutes

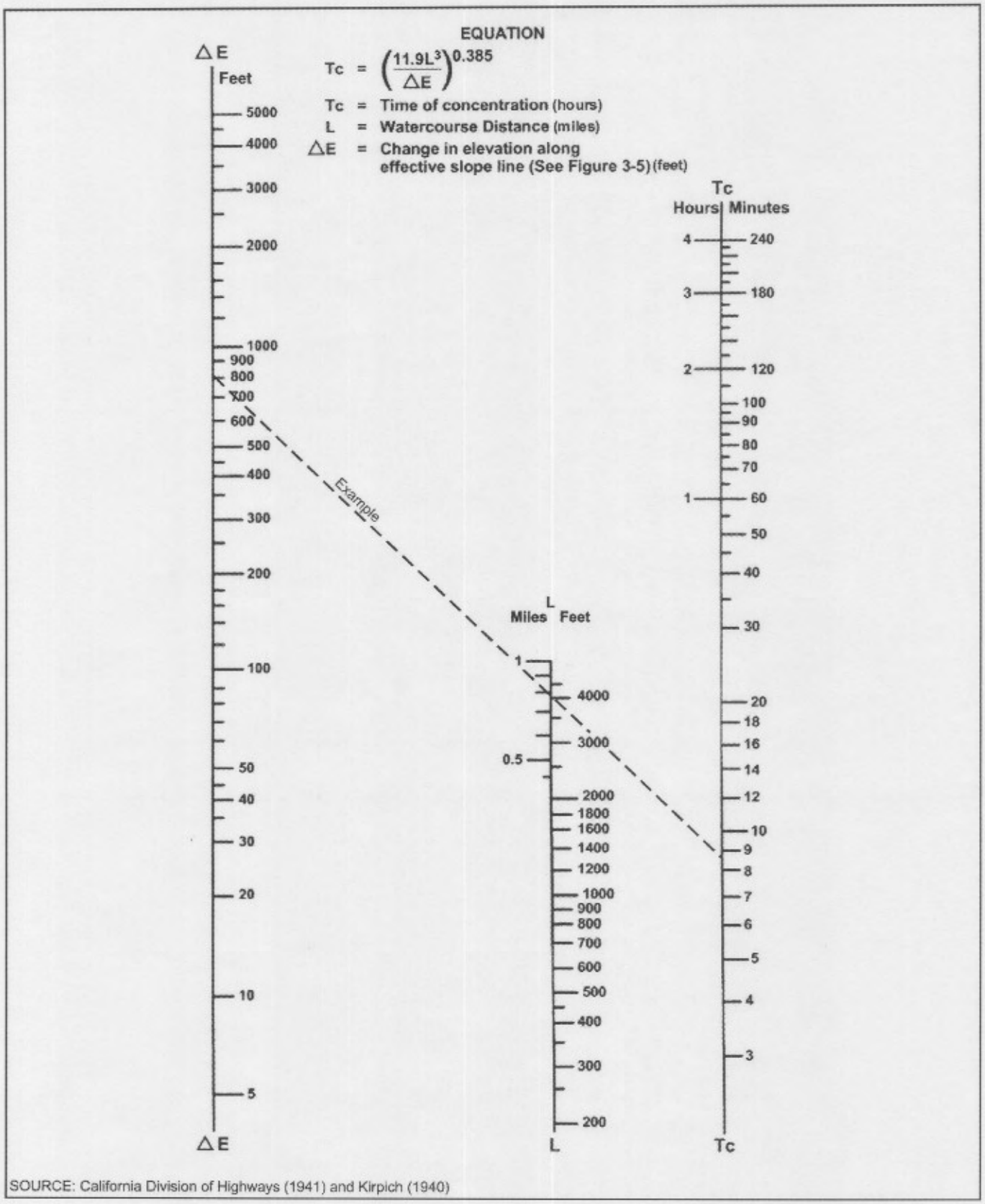
$$T = \frac{1.8\,(1.1-C)\sqrt{D}}{\sqrt[3]{s}}$$

SOURCE: Airport Drainage, Federal Aviation Administration, 1965

FIGURE

3-3

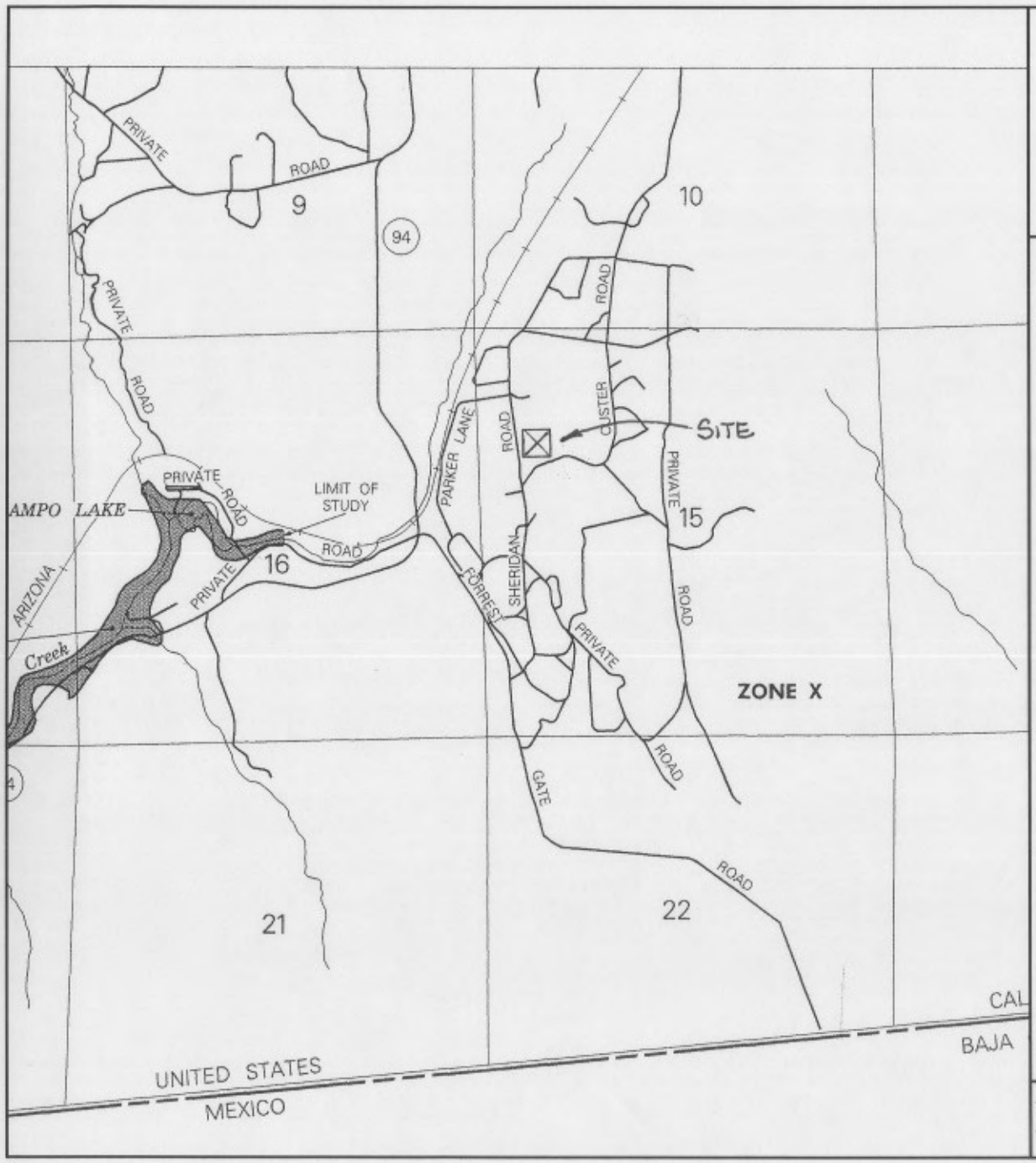
Rational Formula - Overland Time of Flow Nomograph



SOURCE: California Division of Highways (1941) and Kirpich (1940)

FIGURE 3-4

Nomograph for Determination of
Time of Concentration (Tc) or Travel Time (Tt) for Natural Watersheds



APPROXIMATE SCALE IN FEET

2000 0 2000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM

FLOOD INSURANCE RATE MAP

SAN DIEGO COUNTY, CALIFORNIA AND INCORPORATED AREAS

PANEL 2300 OF 2375

(SEE MAP INDEX FOR PANELS NOT PRINTED)

CONTAINS: COMMUNITY	NUMBER	PANEL	SUFFIX
SAN DIEGO COUNTY, UNINCORPORATED AREAS	060284	2300	F

MAP NUMBER
06073C2300 F

EFFECTIVE DATE:
JUNE 19, 1997

Federal Emergency Management Agency

COUNTY OF SAN DIEGO

COMMUNITY SERVICES AGENCY

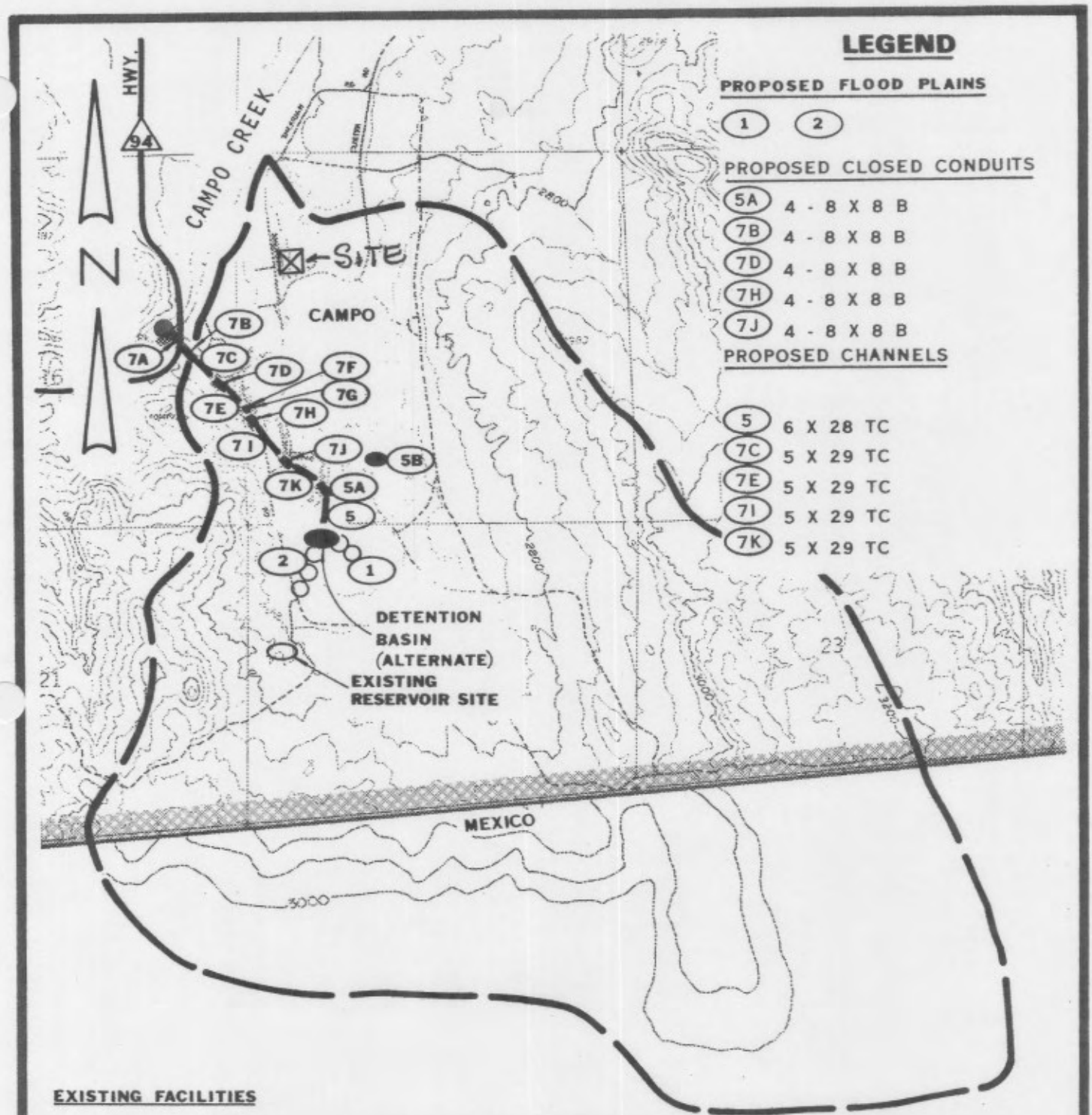
Department of Sanitation & Flood Control

B. V. ELKINS
Acting Director

COMPREHENSIVE PLAN
FOR
FLOOD CONTROL AND DRAINAGE
SAN DIEGO COUNTY FLOOD CONTROL DISTRICT
ZONE 4

AUGUST 1975

HIRSCH & KOPTIONAK
CONSULTING ENGINEERS
SAN DIEGO, CALIFORNIA



LEGEND

PROPOSED FLOOD PLAINS

(1) (2)

PROPOSED CLOSED CONDUITS

(5A)	4 - 8 X 8 B
(7B)	4 - 8 X 8 B
(7D)	4 - 8 X 8 B
(7H)	4 - 8 X 8 B
(7J)	4 - 8 X 8 B

PROPOSED CHANNELS

(5)	6 X 28 TC
(7C)	5 X 29 TC
(7E)	5 X 29 TC
(7I)	5 X 29 TC
(7K)	5 X 29 TC

EXISTING FACILITIES

(7A)	3-6'X5' B
(7F)	10'X 6' TC
(7G)	24" P
(5B)	

COMPREHENSIVE PLAN
FOR FLOOD CONTROL AND DRAINAGE,
SAN DIEGO COUNTY FLOOD CONTROL DISTRICT, ZONE 4

CAMPO
RECOMMENDED FLOOD CONTROL & DRAINAGE FACILITIES PLAN

HIRSCH & KOPTIONAK
CONSULTING ENGINEERS & PLANNERS
5106 FEDERAL BLVD.
SAN DIEGO, CALIFORNIA 92105
714/262-8694

SCALE 1" = 2000'
FIGURE 4
PAGE 86

TABLE 7

SUMMARY OF EXISTING CONDITIONS AND RECOMMENDED IMPROVEMENTS
FOR

CAMPO

ZONE 4, SAN DIEGO COUNTY FLOOD CONTROL DISTRICT

SUB-BASIN OR CONC. PT. NO.[1]	S.D. CTY. G.P. 1990 LAND USE	EXISTING FAC. NO.	EXISTING FAC.	EXISTING CAP. (cfs)	DRAINAGE AREA SUBBASE (sq.mi.)	DRAINAGE AREA TOTAL (sq.mi.)	LOCATION	DESIGN CRITERIA (YR 1990) Q50 (cfs)	DESIGN CRITERIA (YR 1990) Q100 (cfs)	PRESENT OR ANTICIPATED PROBLEMS	RECOMMENDED IMPROVEMENTS	ESTIMATED TOTAL PROJECT COST	P.O.*
1.	Multiple Rural Use		Nat. Swale (L=500')	>1770	2.33	2.33	S. of Rancho del Campo	-	1864	Strip flooding.	1. 200' wide F.Z.[2] 2. 5'x24'TC, ABM 3. 7'x31'TC, riprap	$ 3,000 $40,000(Alt) $42,800(Alt)	
2.	Multiple Rural Use & Rural Resid.		Nat. Swale (L=800')	>607	0.61	0.61	S. of Rancho del Campo	-	607	Strip flooding.	1. 250' wide Flood Zone L=800' 2. 4'x18'TC, ABM[3]	$ 5,700 $46,000(Alt)	
3.	Multiple Rural Use		Nat. Swale (L=1500')		0.09	0.09	SE of Rancho del Campo	106	-	Sheet flow flooding.	By others.	-	
4.	Multiple Rural Use & Rural Resid.				0.08	0.08		97	-	-	By others.	-	
5.	Rural Resid.	5	Grass & dirt Swale (L=800')	900±	0.04	2.94		-	2317	Flooding of property.	6'x28'TC, ABM x800'	$68,600	
		5A	RCB D=2'-6" B=7' & conc. approach apron	115		2.94	Moore Rd. 150'± W. of Moore Rd. & Stuart Rd. Jct.	-	2317	Flooding of streets and buildings.	4-8x8Bx40'	$39,500	

(1) Refer to the legend on pages 81 and 82 for explanation of all abbreviations.
(2) The cost of flood plain management includes the cost of flood plain mapping and zoning estimated at $3000/mile.
(3) ABM is listed, in lieu of reinforced concrete lined trapezoidal channels, due to its inherently lower cost. If trapezoidal channels are chosen with reinforced concrete sides and bottoms, the basic installation cost should be increased approximately 50%.

* P.O. = Project Order - for presently developed areas only.

TABLE 7
CAMPO - continued

B-BASIN CONC. T. NO.	S.D. CTY. G.P. 1990 LAND USE	FAC. NO.	EXISTING FAC.	CAP. (cfs)	DRAINAGE AREA SUBBASE	TOTAL (sq.mi.)	LOCATION	DESIGN CRITERIA (YR 1990) Q50 (cfs)	Q100 (cfs)	PRESENT OR ANTICIPATED PROBLEMS	RECOMMENDED IMPROVEMENTS	ESTIMATED TOTAL PROJECT COST	P.O.
5 ont'd)		5B	Dirt de-tention basin			0.08	Shannon Rd. 900'± NE'ly of Shannon Rd. & Moore Rd. Jct.	97	-	Potential over-flowing of de-tention basin & flooding of streets and buildings.	By others.	-	
6.	Multiple Rural Use & Rural Resid.				0.11	0.11		121	-	No existing facilities. Possible flood-ing of streets and buildings.	By others.	-	
7.	Rural Resid.		(2900LF) im-proved chan. & culverts (see 7A-7K) & Note		0.18	3.23		-	2390	Flooding of streets and existing buildings.	(see Note)	-	
		7A	Wood box culvert 3'-6x 5'	180		3.23	Approx. 100' N. of Hwy. 94 & Forest Gate Rd. Jct.	-	2390	Potential flood-ing outside of planning area.	Railway Facility.	-	
		7B	Series of pipes 68" metal pipe, 54" metal pipe, & 2'-6"x7' RCB	140		3.23	At Jct. of Hwy. 94 & Forest Gate Rd. Jct.	-	2390	Potential flood-ing of streets and buildings.	4-8x8Bx102'	$99,200	

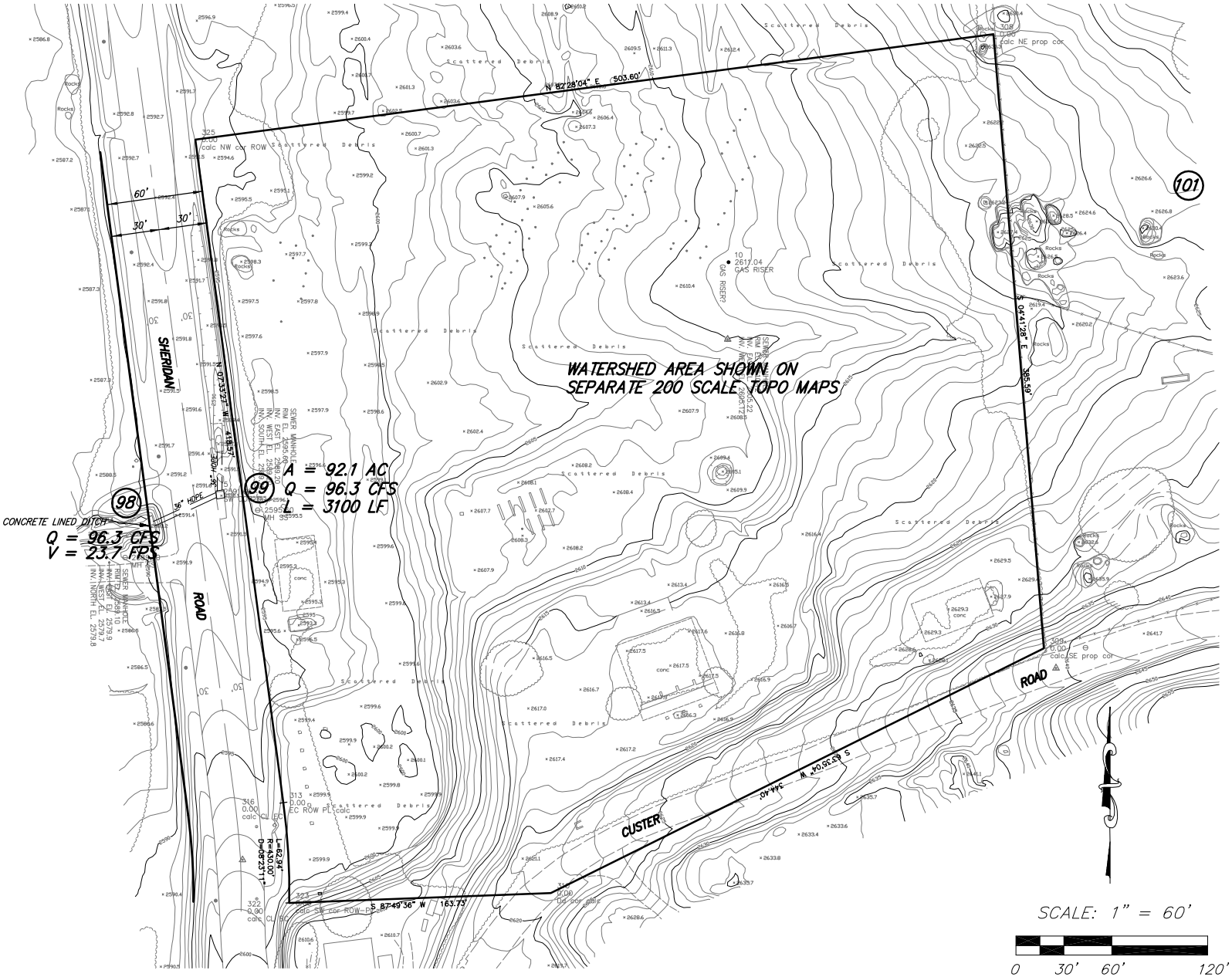
NOTE (A) Flood Overlay Zone

In lieu of providing the recommended improvements detailed hereinbelow to replace existing structures 5A, 7C through 7K, a 32.5 acre flood plain overlay zone could be provided in conjunction with the recommended improvements for item 7B, at a total estimated cost of $31,600. This flood plain would run all the way through Campo (±2900 LF) and average 400 feet in width. If this alternate is selected, a major portion of Campo's presently developed area would be within the flood plain.

(B) In lieu of providing any of the proposed improvements (1-7K), construct a detention basin upstream from Campo. Approx. cost $150,000.

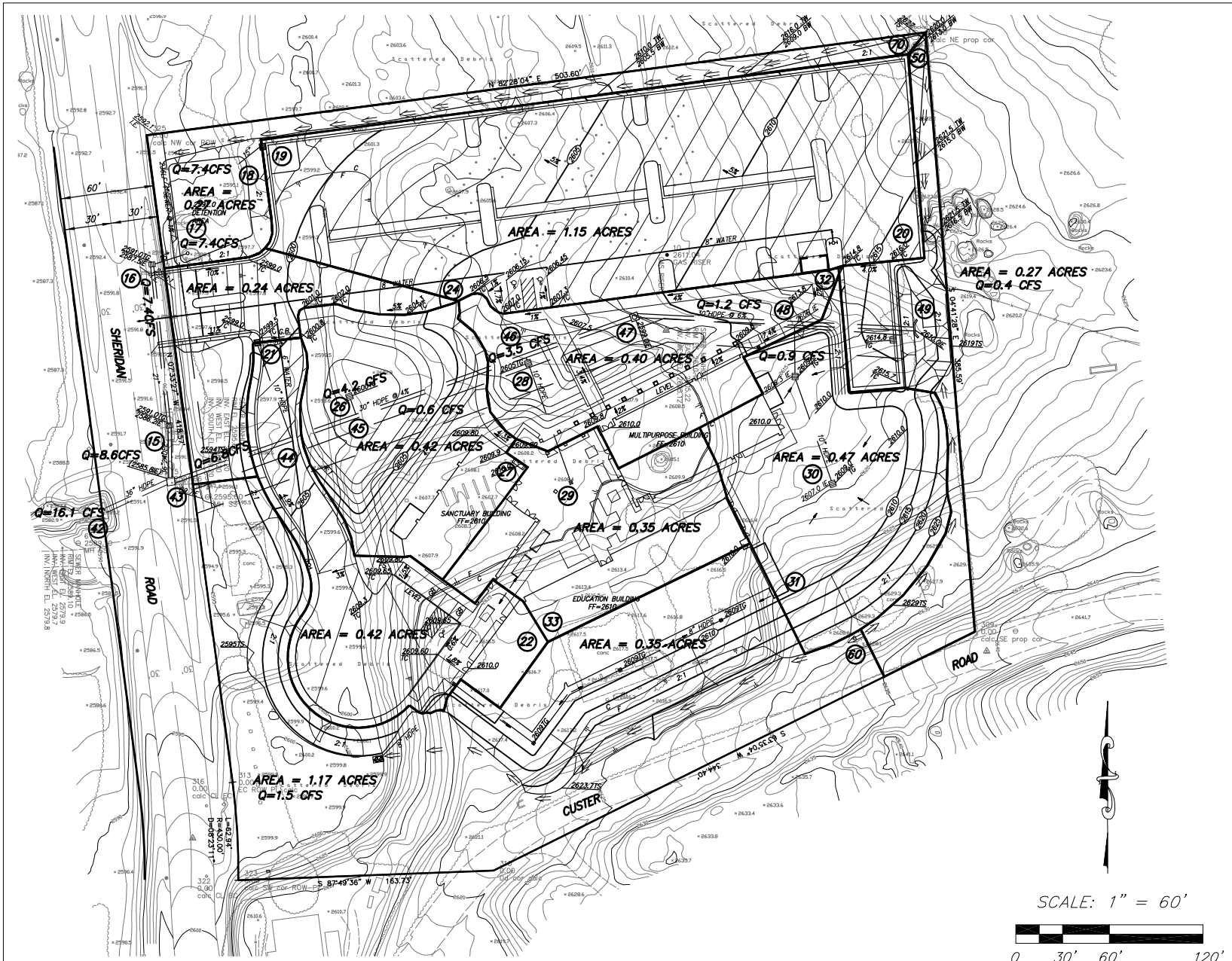
TABLE 7
CAMPO - continu

B-BASIN CONC. T. NO.	S.D. CTY. G.P. 1990 LAND USE	FAC. NO.	EXISTING FAC.	CAP. (cfs)	DRAINAGE AREA SUBBASE (sq.mi.)	TOTAL	LOCATION	DESIGN CRITERIA (YR 1990) Q50 (cfs)	Q100 (cfs)	PRESENT OR ANTICIPATED PROBLEMS	RECOMMENDED IMPROVEMENTS	ESTIMATED TOTAL PROJECT COST	P.O.
7 (cont'd)		7I	Conc. channel 3/1 side slopes D=2'-6" b=4'	520			West of Jeb Stuart Rd. btw Jct. of Jeb Stuart Rd. & Forest Gate Rd. & Kling Ln.	-	2390	Potential flooding of streets and buildings.	5x29TC, ABM x 800 LF	$76,000	
		7J	RCB D=2'-6" b=8'	115			Jct. of Jeb Stuart Rd. & Sheridan Rd.	-	2390	Potential flooding of streets and buildings.	4-8x8Bx40'	$39,500	
		7K	Dirt channel Depth 3' Top Width 20'	185			E'ly of Jeb Stuart Rd. btw Sheridan Rd. & Moore Rd.	-	2390	Potential flooding of streets and buildings. Channel is presently blocked.	5x29TC, ABM x 650 LF	$62,000	
8.	Rural Resid.				0.09	0.09		112	-	Potential flooding.	By others.	-	
9.	Multiple Rural Use & Rural Resid.				0.04	0.13		141	-	Flooding of streets.	By others.	-	
10.	Multiple Rural Use				0.06	0.06		103	-	Not in Planning Area. No existing drainage facilities.		-	
11.	Rural Resid.				0.09	0.09		112	-	Potential flooding of streets and buildings.	By others.	-	
											Total Estimated Projects Cost for the Campo Planning Area	$608,000	



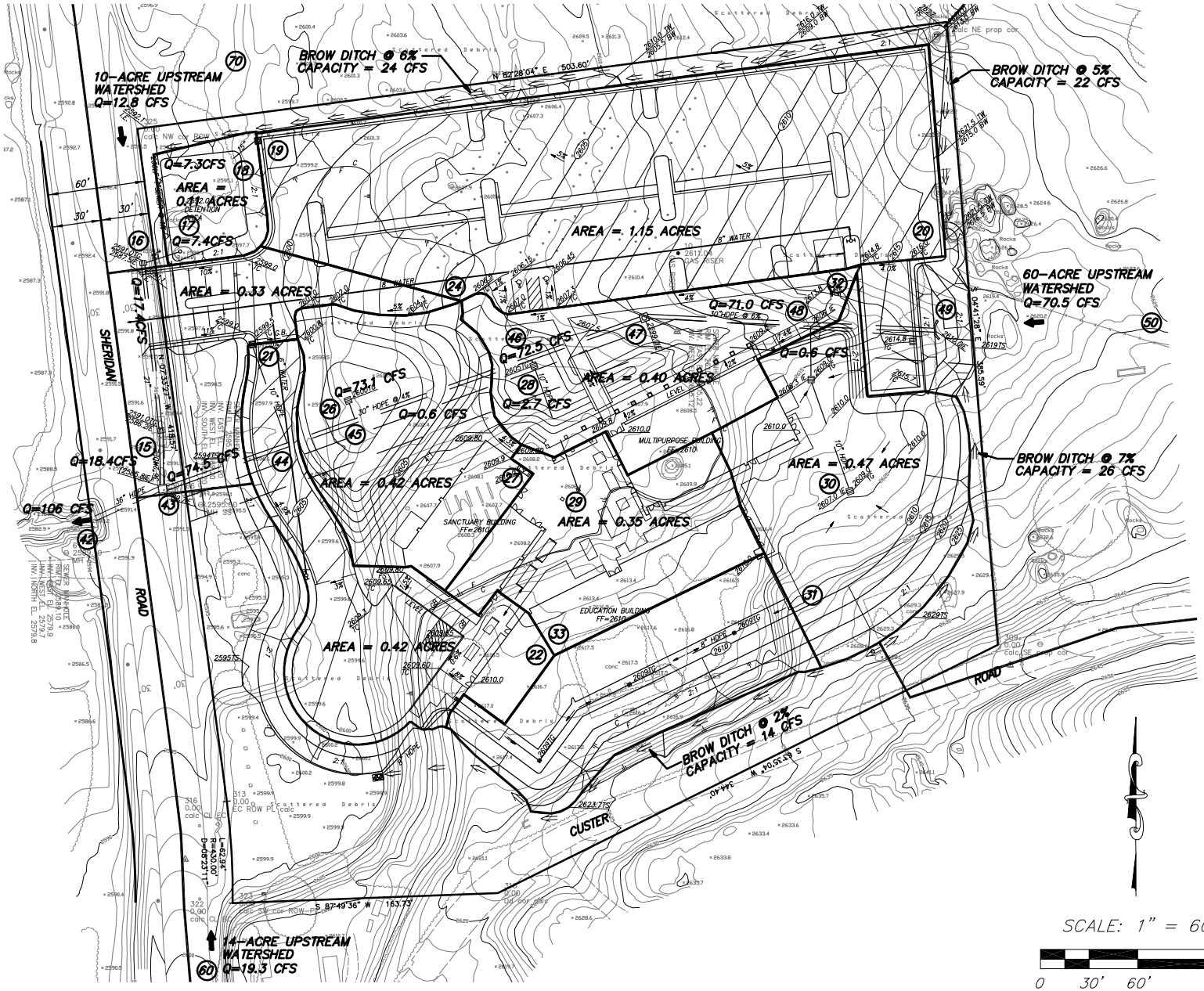
CHERRY ENGINEERING
12721 Poway Road, Poway, CA 92064
Ph (858) 679-3410 Fax (858) 679-3416

ST ADELAIDE CHURCH
EXISTING DRAINAGE MAP



CHERRY ENGINEERING
12721 Poway Road, Poway, CA 92064
Ph (858) 679-3410 Fax (858) 679-3416

ST ADELAIDE CHURCH
SITE DRAINAGE MAP



CHERRY ENGINEERING
12721 Poway Road, Poway, CA 92064
Ph (858) 679-3410 Fax (858) 679-3416

ST ADELAIDE CHURCH
OVERALL DRAINAGE MAP

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2004 Version 7.4

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
Rational Hydrology Study Date: 11/09/05

St Adelaide's Church - 100 Year Hydology
Existing 36" storm drain
stadelaidex

********* Hydrology Study Control Information **********

Program License Serial Number 5020

Rational hydrology study storm event year is 100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour, precipitation(inches) = 3.000
24 hour precipitation(inches) = 5.700
P6/P24 = 52.6%
San Diego hydrology manual 'C' values used

++

Process from Point/Station 101.000 to Point/Station 99.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.500
Decimal fraction soil group B = 0.500
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[LOW DENSITY RESIDENTIAL]
(1.0 DU/A or Less)
Impervious value, Ai = 0.100
Sub-Area C Value = 0.295
Initial subarea total flow distance = 3100.000(Ft.)
Highest elevation = 2884.000(Ft.)
Lowest elevation = 2590.000(Ft.)
Elevation difference = 294.000(Ft.) Slope = 9.484 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of 9.48 %, in a development type of
1.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration = 6.85 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.2950)*(100.000^.5)/(9.484^(1/3)]= 6.85
The initial area total distance of 3100.00 (Ft.) entered leaves a
remaining distance of 3000.00 (Ft.)
Using Figure 3-4, the travel time for this distance is 9.20 minutes
for a distance of 3000.00 (Ft.) and a slope of 9.48 %
with an elevation difference of 284.52(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
= 9.201 Minutes
Tt=[(11.9*0.5682^3)/(284.52)]^.385= 9.20
Total initial area Ti = 6.85 minutes from Figure 3-3 formula plus
9.20 minutes from the Figure 3-4 formula = 16.05 minutes
Rainfall intensity (I) = 3.726(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.295
Subarea runoff = 101.229(CFS)

Total initial stream area = 92.100(Ac.)

++
Process from Point/Station 99.000 to Point/Station 98.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
_____
Upstream point/station elevation = 2585.800(Ft.)
Downstream point/station elevation = 2583.200(Ft.)
Pipe length = 45.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 101.229(CFS)
Given pipe size = 36.00(In.)
Calculated individual pipe flow = 101.229(CFS)
Normal flow depth in pipe = 20.77(In.)
Flow top width inside pipe = 35.57(In.)
Critical depth could not be calculated.
Pipe flow velocity = 23.99(Ft/s)
Travel time through pipe = 0.03 min.
Time of concentration (TC) = 16.08 min.
End of computations, total study area = 92.100 (Ac.)

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2004 Version 7.4

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
Rational Hydrology Study Date: 04/27/05

St. Adelaide's Church - 100 Year Hydrology
Site Drainage Excluding Runon

********* Hydrology Study Control Information **********

Program License Serial Number 5020

Rational hydrology study storm event year is 100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour, precipitation(inches) = 3.000
24 hour precipitation(inches) = 5.700
P6/P24 = 52.6%
San Diego hydrology manual 'C' values used

++

Process from Point/Station 50.000 to Point/Station 49.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[LOW DENSITY RESIDENTIAL]
(1.0 DU/A or Less)
Impervious value, Ai = 0.100
Sub-Area C Value = 0.270
Initial subarea total flow distance = 190.000(Ft.)
Highest elevation = 2627.000(Ft.)
Lowest elevation = 2610.000(Ft.)
Elevation difference = 17.000(Ft.) Slope = 8.947 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of 8.95 %, in a development type of
1.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration = 7.20 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.2700)*(100.000^.5)/(8.947^(1/3)]= 7.20
The initial area total distance of 190.00 (Ft.) entered leaves a
remaining distance of 90.00 (Ft.)
Using Figure 3-4, the travel time for this distance is 0.63 minutes
for a distance of 90.00 (Ft.) and a slope of 8.95 %
with an elevation difference of 8.05(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
= 0.632 Minutes
Tt=[(11.9*0.0170^3)/(8.05)]^.385= 0.63
Total initial area Ti = 7.20 minutes from Figure 3-3 formula plus
0.63 minutes from the Figure 3-4 formula = 7.83 minutes
Rainfall intensity (I) = 5.919(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.270
Subarea runoff = 0.432(CFS)

Total initial stream area = 0.270(Ac.)

++
Process from Point/Station 49.000 to Point/Station 48.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
_____
Upstream point/station elevation = 2610.000(Ft.)
Downstream point/station elevation = 2605.300(Ft.)
Pipe length = 75.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 0.432(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 0.432(CFS)
Normal flow depth in pipe = 1.41(In.)
Flow top width inside pipe = 12.69(In.)
Critical depth could not be calculated.
Pipe flow velocity = 5.16(Ft/s)
Travel time through pipe = 0.24 min.
Time of concentration (TC) = 8.07 min.

++
Process from Point/Station 49.000 to Point/Station 48.000
**** CONFLUENCE OF MINOR STREAMS ****
_____
Along Main Stream number: 1 in normal stream number 1
Stream flow area = 0.270(Ac.)
Runoff from this stream = 0.432(CFS)
Time of concentration = 8.07 min.
Rainfall intensity = 5.804(In/Hr)

++
Process from Point/Station 31.000 to Point/Station 30.000
**** INITIAL AREA EVALUATION ****
_____
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[LOW DENSITY RESIDENTIAL]
(2.9 DU/A or Less)
Impervious value, Ai = 0.250
Sub-Area C Value = 0.380
Initial subarea total flow distance = 80.000(Ft.)
Highest elevation = 2610.000(Ft.)
Lowest elevation = 2609.000(Ft.)
Elevation difference = 1.000(Ft.) Slope = 1.250 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 70.00 (Ft)
for the top area slope value of 1.25 %, in a development type of
2.9 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration = 10.07 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3800)*(70.000^.5)/(1.250^(1/3)]= 10.07
The initial area total distance of 80.00 (Ft.) entered leaves a
remaining distance of 10.00 (Ft.)
Using Figure 3-4, the travel time for this distance is 0.25 minutes
for a distance of 10.00 (Ft.) and a slope of 1.25 %
with an elevation difference of 0.13(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
= 0.248 Minutes
Tt=[(11.9*0.0019^3)/(0.13)]^.385= 0.25
Total initial area Ti = 10.07 minutes from Figure 3-3 formula plus
0.25 minutes from the Figure 3-4 formula = 10.31 minutes
Rainfall intensity (I) = 4.955(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.380
Subarea runoff = 0.885(CFS)

Total initial stream area = 0.470(Ac.)

++
Process from Point/Station 30.000 to Point/Station 48.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____
Upstream point/station elevation = 2607.000(Ft.)
Downstream point/station elevation = 2606.000(Ft.)
Pipe length = 100.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 0.885(CFS)
Nearest computed pipe diameter = 9.00(In.)
Calculated individual pipe flow = 0.885(CFS)
Normal flow depth in pipe = 4.68(In.)
Flow top width inside pipe = 8.99(In.)
Critical Depth = 5.17(In.)
Pipe flow velocity = 3.81(Ft/s)
Travel time through pipe = 0.44 min.
Time of concentration (TC) = 10.75 min.

++
Process from Point/Station 30.000 to Point/Station 48.000
**** CONFLUENCE OF MINOR STREAMS ****
_____
Along Main Stream number: 1 in normal stream number 2
Stream flow area = 0.470(Ac.)
Runoff from this stream = 0.885(CFS)
Time of concentration = 10.75 min.
Rainfall intensity = 4.824(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	0.432	8.07	5.804
2	0.885	10.75	4.824

Qmax(1) =
1.000 * 1.000 * 0.432) +
1.000 * 0.751 * 0.885) + = 1.096
Qmax(2) =
0.831 * 1.000 * 0.432) +
1.000 * 1.000 * 0.885) + = 1.244

Total of 2 streams to confluence:
Flow rates before confluence point:
0.432 0.885
Maximum flow rates at confluence using above data:
1.096 1.244
Area of streams before confluence:
0.270 0.470
Results of confluence:
Total flow rate = 1.244(CFS)
Time of concentration = 10.752 min.
Effective stream area after confluence = 0.740(Ac.)

++
Process from Point/Station 48.000 to Point/Station 47.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
_____
Upstream point/station elevation = 2605.300(Ft.)
Downstream point/station elevation = 2599.000(Ft.)
Pipe length = 100.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 1.244(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 1.244(CFS)
Normal flow depth in pipe = 2.31(In.)

Flow top width inside pipe = 16.01(In.)
Critical depth could not be calculated.
Pipe flow velocity = 7.13(Ft/s)
Travel time through pipe = 0.23 min.
Time of concentration (TC) = 10.99 min.

++
Process from Point/Station 47.000 to Point/Station 46.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
_____
Upstream point/station elevation = 2599.000(Ft.)
Downstream point/station elevation = 2595.900(Ft.)
Pipe length = 75.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 1.244(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 1.244(CFS)
Normal flow depth in pipe = 2.56(In.)
Flow top width inside pipe = 16.75(In.)
Critical depth could not be calculated.
Pipe flow velocity = 6.16(Ft/s)
Travel time through pipe = 0.20 min.
Time of concentration (TC) = 11.19 min.

++
Process from Point/Station 47.000 to Point/Station 46.000
**** CONFLUENCE OF MAIN STREAMS ****
_____
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area = 0.740(Ac.)
Runoff from this stream = 1.244(CFS)
Time of concentration = 11.19 min.
Rainfall intensity = 4.701(In/Hr)
Program is now starting with Main Stream No. 2

++
Process from Point/Station 33.000 to Point/Station 29.000
**** INITIAL AREA EVALUATION ****
_____
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[COMMERCIAL area type]
(General Commercial)
Impervious value, Ai = 0.850
Sub-Area C Value = 0.800
Initial subarea total flow distance = 100.000(Ft.)
Highest elevation = 2610.000(Ft.)
Lowest elevation = 2609.000(Ft.)
Elevation difference = 1.000(Ft.) Slope = 1.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 60.00 (Ft)
for the top area slope value of 1.00 %, in a development type of
General Commercial
In Accordance With Figure 3-3
Initial Area Time of Concentration = 4.18 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8000)*(60.000^.5)/(1.000^(1/3)]= 4.18
The initial area total distance of 100.00 (Ft.) entered leaves a
remaining distance of 40.00 (Ft.)
Using Figure 3-4, the travel time for this distance is 0.79 minutes
for a distance of 40.00 (Ft.) and a slope of 1.00 %
with an elevation difference of 0.40(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
= 0.787 Minutes

Tt=[(11.9*0.0076^3)/(0.40)]^.385= 0.79
Total initial area Ti = 4.18 minutes from Figure 3-3 formula plus
0.79 minutes from the Figure 3-4 formula = 4.97 minutes
Calculated TC of 4.970 minutes is less than 5 minutes,
resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) = 7.904(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.800
Subarea runoff = 2.213(CFS)
Total initial stream area = 0.350(Ac.)

++
Process from Point/Station 29.000 to Point/Station 28.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____
Upstream point/station elevation = 2607.000(Ft.)
Downstream point/station elevation = 2597.000(Ft.)
Pipe length = 80.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 2.213(CFS)
Nearest computed pipe diameter = 9.00(In.)
Calculated individual pipe flow = 2.213(CFS)
Normal flow depth in pipe = 3.84(In.)
Flow top width inside pipe = 8.90(In.)
Critical Depth = 8.01(In.)
Pipe flow velocity = 12.32(Ft/s)
Travel time through pipe = 0.11 min.
Time of concentration (TC) = 5.08 min.

++
Process from Point/Station 29.000 to Point/Station 28.000
**** CONFLUENCE OF MINOR STREAMS ****
_____
Along Main Stream number: 2 in normal stream number 1
Stream flow area = 0.350(Ac.)
Runoff from this stream = 2.213(CFS)
Time of concentration = 5.08 min.
Rainfall intensity = 7.825(In/Hr)

++
Process from Point/Station 32.000 to Point/Station 28.000
**** INITIAL AREA EVALUATION ****
_____
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL]
(7.3 DU/A or Less)
Impervious value, Ai = 0.400
Sub-Area C Value = 0.480
Initial subarea total flow distance = 225.000(Ft.)
Highest elevation = 2614.800(Ft.)
Lowest elevation = 2605.000(Ft.)
Elevation difference = 9.800(Ft.) Slope = 4.356 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of 4.36 %, in a development type of
7.3 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration = 6.83 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4800)*(100.000^.5)/(4.356^(1/3)]= 6.83
The initial area total distance of 225.00 (Ft.) entered leaves a
remaining distance of 125.00 (Ft.)
Using Figure 3-4, the travel time for this distance is 1.07 minutes
for a distance of 125.00 (Ft.) and a slope of 4.36 %
with an elevation difference of 5.45(Ft.) from the end of the top area

Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 = 1.074 Minutes
Tt=[(11.9*0.0237^3)/(5.45)]^.385= 1.07
Total initial area Ti = 6.83 minutes from Figure 3-3 formula plus
 1.07 minutes from the Figure 3-4 formula = 7.91 minutes
Rainfall intensity (I) = 5.881(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.480
Subarea runoff = 1.129(CFS)
Total initial stream area = 0.400(Ac.)

++
Process from Point/Station 32.000 to Point/Station 28.000
**** CONFLUENCE OF MINOR STREAMS ****
_____
Along Main Stream number: 2 in normal stream number 2
Stream flow area = 0.400(Ac.)
Runoff from this stream = 1.129(CFS)
Time of concentration = 7.91 min.
Rainfall intensity = 5.881(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	2.213	5.08	7.825
2	1.129	7.91	5.881

Qmax(1) =
  1.000 * 1.000 * 2.213) +
  1.000 * 0.642 * 1.129) + = 2.938
Qmax(2) =
  0.752 * 1.000 * 2.213) +
  1.000 * 1.000 * 1.129) + = 2.792

Total of 2 streams to confluence:
Flow rates before confluence point:
  2.213 1.129
Maximum flow rates at confluence using above data:
  2.938 2.792
Area of streams before confluence:
  0.350 0.400
Results of confluence:
Total flow rate = 2.938(CFS)
Time of concentration = 5.078 min.
Effective stream area after confluence = 0.750(Ac.)

++
Process from Point/Station 28.000 to Point/Station 46.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____
Upstream point/station elevation = 2597.000(Ft.)
Downstream point/station elevation = 2596.800(Ft.)
Pipe length = 5.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 2.938(CFS)
Nearest computed pipe diameter = 9.00(In.)
Calculated individual pipe flow = 2.938(CFS)
Normal flow depth in pipe = 6.60(In.)
Flow top width inside pipe = 7.96(In.)
Critical depth could not be calculated.
Pipe flow velocity = 8.46(Ft/s)
Travel time through pipe = 0.01 min.
Time of concentration (TC) = 5.09 min.

++
Process from Point/Station 28.000 to Point/Station 46.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area = 0.750(Ac.)
Runoff from this stream = 2.938(CFS)
Time of concentration = 5.09 min.
Rainfall intensity = 7.815(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	1.244	11.19	4.701
2	2.938	5.09	7.815

Qmax(1) =
1.000 * 1.000 * 1.244) +
0.602 * 1.000 * 2.938) + = 3.011
Qmax(2) =
1.000 * 0.455 * 1.244) +
1.000 * 1.000 * 2.938) + = 3.504

Total of 2 main streams to confluence:
Flow rates before confluence point:
1.244 2.938
Maximum flow rates at confluence using above data:
3.011 3.504
Area of streams before confluence:
0.740 0.750

Results of confluence:
Total flow rate = 3.504(CFS)
Time of concentration = 5.088 min.
Effective stream area after confluence = 1.490(Ac.)

++
Process from Point/Station 46.000 to Point/Station 45.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
Upstream point/station elevation = 2595.900(Ft.)
Downstream point/station elevation = 2591.200(Ft.)
Pipe length = 115.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 3.504(CFS)
Given pipe size = 30.00(In.)
Calculated individual pipe flow = 3.504(CFS)
Normal flow depth in pipe = 4.21(In.)
Flow top width inside pipe = 20.83(In.)
Critical Depth = 7.36(In.)
Pipe flow velocity = 8.37(Ft/s)
Travel time through pipe = 0.23 min.
Time of concentration (TC) = 5.32 min.

++
Process from Point/Station 46.000 to Point/Station 45.000
**** CONFLUENCE OF MINOR STREAMS ****
Along Main Stream number: 1 in normal stream number 1
Stream flow area = 1.490(Ac.)
Runoff from this stream = 3.504(CFS)
Time of concentration = 5.32 min.
Rainfall intensity = 7.597(In/Hr)

++
Process from Point/Station 27.000 to Point/Station 26.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[LOW DENSITY RESIDENTIAL]
(2.0 DU/A or Less)
Impervious value, Ai = 0.200
Sub-Area C Value = 0.340
Initial subarea total flow distance = 120.000(Ft.)
Highest elevation = 2610.000(Ft.)
Lowest elevation = 2600.000(Ft.)
Elevation difference = 10.000(Ft.) Slope = 8.333 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of 8.33 %, in a development type of
2.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration = 6.75 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3400)*(100.000^.5)/(8.333^(1/3)]= 6.75
The initial area total distance of 120.00 (Ft.) entered leaves a
remaining distance of 20.00 (Ft.)
Using Figure 3-4, the travel time for this distance is 0.20 minutes
for a distance of 20.00 (Ft.) and a slope of 8.33 %
with an elevation difference of 1.67(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
= 0.204 Minutes
Tt=[(11.9*0.0038^3)/(1.67)]^.385= 0.20
Total initial area Ti = 6.75 minutes from Figure 3-3 formula plus
0.20 minutes from the Figure 3-4 formula = 6.95 minutes
Rainfall intensity (I) = 6.391(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.340
Subarea runoff = 0.913(CFS)
Total initial stream area = 0.420(Ac.)

++
Process from Point/Station 26.000 to Point/Station 45.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 2597.000(Ft.)
Downstream point/station elevation = 2591.500(Ft.)
Pipe length = 15.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 0.913(CFS)
Nearest computed pipe diameter = 6.00(In.)
Calculated individual pipe flow = 0.913(CFS)
Normal flow depth in pipe = 2.12(In.)
Flow top width inside pipe = 5.74(In.)
Critical Depth = 5.55(In.)
Pipe flow velocity = 14.67(Ft/s)
Travel time through pipe = 0.02 min.
Time of concentration (TC) = 6.97 min.

++
Process from Point/Station 26.000 to Point/Station 45.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 0.420(Ac.)
Runoff from this stream = 0.913(CFS)
Time of concentration = 6.97 min.
Rainfall intensity = 6.381(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)

```
1       3.504     5.32              7.597
2       0.913     6.97              6.381
Qmax(1) =
            1.000 *   1.000 *   3.504) +
            1.000 *   0.763 *   0.913) + =      4.200
Qmax(2) =
            0.840 *   1.000 *   3.504) +
            1.000 *   1.000 *   0.913) + =      3.855

Total of 2 streams to confluence:
Flow rates before confluence point:
      3.504       0.913
Maximum flow rates at confluence using above data:
       4.200       3.855
Area of streams before confluence:
       1.490       0.420
Results of confluence:
Total flow rate =      4.200(CFS)
Time of concentration =     5.317 min.
Effective stream area after confluence =      1.910(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       45.000 to Point/Station       44.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
______________________________________________________________________________
Upstream point/station elevation =  2591.200(Ft.)
Downstream point/station elevation =  2589.300(Ft.)
Pipe length  =    45.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     4.200(CFS)
Given pipe size =     30.00(In.)
Calculated individual pipe flow  =     4.200(CFS)
Normal flow depth in pipe =    4.55(In.)
Flow top width inside pipe =   21.53(In.)
Critical Depth =    8.09(In.)
Pipe flow velocity =      8.94(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =     5.40 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       45.000 to Point/Station       44.000
**** CONFLUENCE OF MINOR STREAMS ****
______________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =      1.910(Ac.)
Runoff from this stream =      4.200(CFS)
Time of concentration =    5.40 min.
Rainfall intensity =     7.520(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.000 to Point/Station       21.000
**** INITIAL AREA EVALUATION ****
______________________________________________________________________________
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[COMMERCIAL area type                  ]
(Office Professional    )
Impervious value, Ai = 0.900
Sub-Area C Value = 0.830
Initial subarea total flow distance  =  290.000(Ft.)
Highest elevation = 2610.000(Ft.)
Lowest elevation = 2599.000(Ft.)
Elevation difference =   11.000(Ft.) Slope =  3.793 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
```

The maximum overland flow distance is 80.00 (Ft)
for the top area slope value of 3.79 %, in a development type of
Office Professional
In Accordance With Figure 3-3
Initial Area Time of Concentration = 2.79 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8300)*(80.000^.5)/(3.793^(1/3)]= 2.79
The initial area total distance of 290.00 (Ft.) entered leaves a
remaining distance of 210.00 (Ft.)
Using Figure 3-4, the travel time for this distance is 1.69 minutes
for a distance of 210.00 (Ft.) and a slope of 3.79 %
with an elevation difference of 7.97(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
= 1.690 Minutes
Tt=[(11.9*0.0398^3)/(7.97)]^.385= 1.69
Total initial area Ti = 2.79 minutes from Figure 3-3 formula plus
1.69 minutes from the Figure 3-4 formula = 4.48 minutes
Calculated TC of 4.477 minutes is less than 5 minutes,
resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) = 7.904(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.830
Subarea runoff = 2.755(CFS)
Total initial stream area = 0.420(Ac.)

++
Process from Point/Station 21.000 to Point/Station 44.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____
Upstream point/station elevation = 2596.000(Ft.)
Downstream point/station elevation = 2589.600(Ft.)
Pipe length = 65.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 2.755(CFS)
Nearest computed pipe diameter = 9.00(In.)
Calculated individual pipe flow = 2.755(CFS)
Normal flow depth in pipe = 4.66(In.)
Flow top width inside pipe = 8.99(In.)
Critical Depth = 8.50(In.)
Pipe flow velocity = 11.93(Ft/s)
Travel time through pipe = 0.09 min.
Time of concentration (TC) = 4.57 min.

++
Process from Point/Station 21.000 to Point/Station 44.000
**** CONFLUENCE OF MINOR STREAMS ****
_____
Along Main Stream number: 1 in normal stream number 2
Stream flow area = 0.420(Ac.)
Runoff from this stream = 2.755(CFS)
Time of concentration = 4.57 min.
Rainfall intensity = 7.904(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	4.200	5.40	7.520
2	2.755	4.57	7.904

Qmax(1) =
1.000 * 1.000 * 4.200) +
0.951 * 1.000 * 2.755) + = 6.822
Qmax(2) =
1.000 * 0.846 * 4.200) +
1.000 * 1.000 * 2.755) + = 6.308

Total of 2 streams to confluence:
Flow rates before confluence point:

```
      4.200       2.755
Maximum flow rates at confluence using above data:
       6.822       6.308
Area of streams before confluence:
       1.910       0.420
Results of confluence:
Total flow rate =      6.822(CFS)
Time of concentration =     5.401 min.
Effective stream area after confluence =      2.330(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       44.000 to Point/Station       43.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =  2589.300(Ft.)
Downstream point/station elevation =  2585.800(Ft.)
Pipe length  =    80.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     6.822(CFS)
Given pipe size =     30.00(In.)
Calculated individual pipe flow  =     6.822(CFS)
Normal flow depth in pipe =    5.72(In.)
Flow top width inside pipe =   23.57(In.)
Critical Depth =   10.38(In.)
Pipe flow velocity =     10.45(Ft/s)
Travel time through pipe =    0.13 min.
Time of concentration (TC) =     5.53 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       44.000 to Point/Station       43.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      2.330(Ac.)
Runoff from this stream =      6.822(CFS)
Time of concentration =    5.53 min.
Rainfall intensity =     7.408(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       20.000 to Point/Station       19.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[COMMERCIAL area type                  ]
(Office Professional    )
Impervious value, Ai = 0.900
Sub-Area C Value = 0.830
Initial subarea total flow distance  =  430.000(Ft.)
Highest elevation = 2616.000(Ft.)
Lowest elevation = 2598.000(Ft.)
Elevation difference =   18.000(Ft.) Slope =  4.186 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 90.00 (Ft)
for the top area slope value of   4.19 %, in a development type of
 Office Professional
In Accordance With Figure 3-3
Initial Area Time of Concentration =   2.86 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8300)*(  90.000^.5)/(   4.186^(1/3)]=   2.86
The initial area total distance of  430.00 (Ft.) entered leaves a
remaining distance of  340.00 (Ft.)
Using Figure 3-4, the travel time for this distance is   2.36 minutes
```

for a distance of 340.00 (Ft.) and a slope of 4.19 %
with an elevation difference of 14.23(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
= 2.357 Minutes
Tt=[(11.9*0.0644^3)/(14.23)]^.385= 2.36
Total initial area Ti = 2.86 minutes from Figure 3-3 formula plus
2.36 minutes from the Figure 3-4 formula = 5.22 minutes
Rainfall intensity (I) = 7.689(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.830
Subarea runoff = 7.339(CFS)
Total initial stream area = 1.150(Ac.)

++
Process from Point/Station 19.000 to Point/Station 18.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____
Upstream point/station elevation = 2595.000(Ft.)
Downstream point/station elevation = 2593.000(Ft.)
Pipe length = 20.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 7.339(CFS)
Nearest computed pipe diameter = 12.00(In.)
Calculated individual pipe flow = 7.339(CFS)
Normal flow depth in pipe = 7.05(In.)
Flow top width inside pipe = 11.81(In.)
Critical depth could not be calculated.
Pipe flow velocity = 15.28(Ft/s)
Travel time through pipe = 0.02 min.
Time of concentration (TC) = 5.24 min.

++
Process from Point/Station 19.000 to Point/Station 18.000
**** CONFLUENCE OF MINOR STREAMS ****
_____
Along Main Stream number: 2 in normal stream number 1
Stream flow area = 1.150(Ac.)
Runoff from this stream = 7.339(CFS)
Time of concentration = 5.24 min.
Rainfall intensity = 7.669(In/Hr)

++
Process from Point/Station 18.000 to Point/Station 17.000
**** INITIAL AREA EVALUATION ****
_____
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN]
(Permanent Open Space)
Impervious value, Ai = 0.000
Sub-Area C Value = 0.200
Initial subarea total flow distance = 70.000(Ft.)
Highest elevation = 2593.000(Ft.)
Lowest elevation = 2592.000(Ft.)
Elevation difference = 1.000(Ft.) Slope = 1.429 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 70.00 (Ft)
for the top area slope value of 1.43 %, in a development type of
Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration = 12.03 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.2000)*(70.000^.5)/(1.429^(1/3)]= 12.03
Rainfall intensity (I) = 4.486(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.200
Subarea runoff = 0.242(CFS)

Total initial stream area = 0.270(Ac.)

++
Process from Point/Station 18.000 to Point/Station 17.000
**** CONFLUENCE OF MINOR STREAMS ****
_____
Along Main Stream number: 2 in normal stream number 2
Stream flow area = 0.270(Ac.)
Runoff from this stream = 0.242(CFS)
Time of concentration = 12.03 min.
Rainfall intensity = 4.486(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	7.339	5.24	7.669
2	0.242	12.03	4.486

Qmax(1) =
1.000 * 1.000 * 7.339) +
1.000 * 0.435 * 0.242) + = 7.445
Qmax(2) =
0.585 * 1.000 * 7.339) +
1.000 * 1.000 * 0.242) + = 4.536

Total of 2 streams to confluence:
Flow rates before confluence point:
7.339 0.242
Maximum flow rates at confluence using above data:
7.445 4.536
Area of streams before confluence:
1.150 0.270
Results of confluence:
Total flow rate = 7.445(CFS)
Time of concentration = 5.240 min.
Effective stream area after confluence = 1.420(Ac.)

++
Process from Point/Station 17.000 to Point/Station 16.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____
Upstream point/station elevation = 2588.500(Ft.)
Downstream point/station elevation = 2587.500(Ft.)
Pipe length = 25.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 7.445(CFS)
Nearest computed pipe diameter = 15.00(In.)
Calculated individual pipe flow = 7.445(CFS)
Normal flow depth in pipe = 8.17(In.)
Flow top width inside pipe = 14.94(In.)
Critical Depth = 13.04(In.)
Pipe flow velocity = 10.90(Ft/s)
Travel time through pipe = 0.04 min.
Time of concentration (TC) = 5.28 min.

++
Process from Point/Station 16.000 to Point/Station 15.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____
Upstream point/station elevation = 2587.500(Ft.)
Downstream point/station elevation = 2586.200(Ft.)
Pipe length = 105.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 7.445(CFS)
Nearest computed pipe diameter = 18.00(In.)
Calculated individual pipe flow = 7.445(CFS)
Normal flow depth in pipe = 10.43(In.)

Flow top width inside pipe = 17.77(In.)
Critical Depth = 12.68(In.)
Pipe flow velocity = 7.01(Ft/s)
Travel time through pipe = 0.25 min.
Time of concentration (TC) = 5.53 min.

++
Process from Point/Station 16.000 to Point/Station 15.000
**** CONFLUENCE OF MINOR STREAMS ****
_____
Along Main Stream number: 2 in normal stream number 1
Stream flow area = 1.420(Ac.)
Runoff from this stream = 7.445(CFS)
Time of concentration = 5.53 min.
Rainfall intensity = 7.409(In/Hr)

++
Process from Point/Station 24.000 to Point/Station 15.000
**** INITIAL AREA EVALUATION ****
_____
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[HIGH DENSITY RESIDENTIAL]
(24.0 DU/A or Less)
Impervious value, Ai = 0.650
Sub-Area C Value = 0.660
Initial subarea total flow distance = 250.000(Ft.)
Highest elevation = 2605.500(Ft.)
Lowest elevation = 2591.000(Ft.)
Elevation difference = 14.500(Ft.) Slope = 5.800 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 95.00 (Ft)
for the top area slope value of 5.80 %, in a development type of
24.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration = 4.30 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6600)*(95.000^.5)/(5.800^(1/3)]= 4.30
The initial area total distance of 250.00 (Ft.) entered leaves a
remaining distance of 155.00 (Ft.)
Using Figure 3-4, the travel time for this distance is 1.14 minutes
for a distance of 155.00 (Ft.) and a slope of 5.80 %
with an elevation difference of 8.99(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
= 1.136 Minutes
Tt=[(11.9*0.0294^3)/(8.99)]^.385= 1.14
Total initial area Ti = 4.30 minutes from Figure 3-3 formula plus
1.14 minutes from the Figure 3-4 formula = 5.43 minutes
Rainfall intensity (I) = 7.493(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.660
Subarea runoff = 1.187(CFS)
Total initial stream area = 0.240(Ac.)

++
Process from Point/Station 24.000 to Point/Station 15.000
**** CONFLUENCE OF MINOR STREAMS ****
_____
Along Main Stream number: 2 in normal stream number 2
Stream flow area = 0.240(Ac.)
Runoff from this stream = 1.187(CFS)
Time of concentration = 5.43 min.
Rainfall intensity = 7.493(In/Hr)
Summary of stream data:

```
Stream   Flow rate      TC          Rainfall Intensity
 No.       (CFS)       (min)             (In/Hr)


1        7.445      5.53              7.409
2        1.187      5.43              7.493
Qmax(1) =
            1.000 *    1.000 *    7.445) +
            0.989 *    1.000 *    1.187) + =       8.618
Qmax(2) =
            1.000 *    0.983 *    7.445) +
            1.000 *    1.000 *    1.187) + =       8.503

Total of 2 streams to confluence:
Flow rates before confluence point:
       7.445       1.187
Maximum flow rates at confluence using above data:
       8.618       8.503
Area of streams before confluence:
       1.420       0.240
Results of confluence:
Total flow rate =      8.618(CFS)
Time of concentration =     5.528 min.
Effective stream area after confluence =      1.660(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       15.000 to Point/Station       43.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________________
Upstream point/station elevation =  2586.200(Ft.)
Downstream point/station elevation =  2585.800(Ft.)
Pipe length  =    40.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =     8.618(CFS)
Nearest computed pipe diameter  =     18.00(In.)
Calculated individual pipe flow  =     8.618(CFS)
Normal flow depth in pipe =   12.41(In.)
Flow top width inside pipe =   16.66(In.)
Critical Depth =   13.64(In.)
Pipe flow velocity =      6.63(Ft/s)
Travel time through pipe =    0.10 min.
Time of concentration (TC) =     5.63 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       15.000 to Point/Station       43.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =      1.660(Ac.)
Runoff from this stream =      8.618(CFS)
Time of concentration =    5.63 min.
Rainfall intensity =     7.323(In/Hr)
Program is now starting with Main Stream No. 3


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       60.000 to Point/Station       43.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________________
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[LOW DENSITY RESIDENTIAL                 ]
(1.0 DU/A or Less       )
Impervious value, Ai = 0.100
Sub-Area C Value = 0.270
```

Initial subarea total flow distance = 600.000(Ft.)
Highest elevation = 2629.000(Ft.)
Lowest elevation = 2591.000(Ft.)
Elevation difference = 38.000(Ft.) Slope = 6.333 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of 6.33 %, in a development type of
1.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration = 8.08 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.2700)*(100.000^.5)/(6.333^(1/3)]= 8.08
The initial area total distance of 600.00 (Ft.) entered leaves a
remaining distance of 500.00 (Ft.)
Using Figure 3-4, the travel time for this distance is 2.71 minutes
for a distance of 500.00 (Ft.) and a slope of 6.33 %
with an elevation difference of 31.66(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
= 2.705 Minutes
Tt=[(11.9*0.0947^3)/(31.66)]^.385= 2.71
Total initial area Ti = 8.08 minutes from Figure 3-3 formula plus
2.71 minutes from the Figure 3-4 formula = 10.78 minutes
Rainfall intensity (I) = 4.816(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.270
Subarea runoff = 1.521(CFS)
Total initial stream area = 1.170(Ac.)

++
Process from Point/Station 60.000 to Point/Station 43.000
**** CONFLUENCE OF MAIN STREAMS ****
_____
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area = 1.170(Ac.)
Runoff from this stream = 1.521(CFS)
Time of concentration = 10.78 min.
Rainfall intensity = 4.816(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	6.822	5.53	7.408
2	8.618	5.63	7.323
3	1.521	10.78	4.816

Qmax(1) =
1.000 * 1.000 * 6.822) +
1.000 * 0.982 * 8.618) +
1.000 * 0.513 * 1.521) + = 16.068
Qmax(2) =
0.989 * 1.000 * 6.822) +
1.000 * 1.000 * 8.618) +
1.000 * 0.522 * 1.521) + = 16.156
Qmax(3) =
0.650 * 1.000 * 6.822) +
0.658 * 1.000 * 8.618) +
1.000 * 1.000 * 1.521) + = 11.623

Total of 3 main streams to confluence:
Flow rates before confluence point:
6.822 8.618 1.521
Maximum flow rates at confluence using above data:
16.068 16.156 11.623
Area of streams before confluence:
2.330 1.660 1.170

Results of confluence:
Total flow rate = 16.156(CFS)
Time of concentration = 5.629 min.
Effective stream area after confluence = 5.160(Ac.)
End of computations, total study area = 5.160 (Ac.)

San Diego County Rational Hydrology Program

CIVILCADD/CIVILDESIGN Engineering Software,(c)1991-2004 Version 7.4

Rational method hydrology program based on
San Diego County Flood Control Division 2003 hydrology manual
Rational Hydrology Study Date: 04/27/05

St. Adelaide's Church - 100 Year Hydrology
Site Drainage Including Runon

********* Hydrology Study Control Information **********

Program License Serial Number 5020

Rational hydrology study storm event year is 100.0
English (in-lb) input data Units used

Map data precipitation entered:
6 hour, precipitation(inches) = 3.000
24 hour precipitation(inches) = 5.700
P6/P24 = 52.6%
San Diego hydrology manual 'C' values used

++

Process from Point/Station 50.000 to Point/Station 49.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 0.500
Decimal fraction soil group B = 0.500
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[LOW DENSITY RESIDENTIAL]
(1.0 DU/A or Less)
Impervious value, Ai = 0.100
Sub-Area C Value = 0.295
Initial subarea total flow distance = 2600.000(Ft.)
Highest elevation = 2884.000(Ft.)
Lowest elevation = 2619.000(Ft.)
Elevation difference = 265.000(Ft.) Slope = 10.192 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of 10.19 %, in a development type of
1.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration = 6.68 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.2950)*(100.000^.5)/(10.192^(1/3)]= 6.68
The initial area total distance of 2600.00 (Ft.) entered leaves a
remaining distance of 2500.00 (Ft.)
Using Figure 3-4, the travel time for this distance is 7.78 minutes
for a distance of 2500.00 (Ft.) and a slope of 10.19 %
with an elevation difference of 254.80(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
= 7.777 Minutes
Tt=[(11.9*0.4735^3)/(254.80)]^.385= 7.78
Total initial area Ti = 6.68 minutes from Figure 3-3 formula plus
7.78 minutes from the Figure 3-4 formula = 14.46 minutes
Rainfall intensity (I) = 3.985(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.295
Subarea runoff = 70.526(CFS)

Total initial stream area = 60.000(Ac.)

++
Process from Point/Station 49.000 to Point/Station 48.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____
Upstream point/station elevation = 2610.000(Ft.)
Downstream point/station elevation = 2605.300(Ft.)
Pipe length = 77.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 70.526(CFS)
Nearest computed pipe diameter = 27.00(In.)
Calculated individual pipe flow = 70.526(CFS)
Normal flow depth in pipe = 20.44(In.)
Flow top width inside pipe = 23.16(In.)
Critical depth could not be calculated.
Pipe flow velocity = 21.84(Ft/s)
Travel time through pipe = 0.06 min.
Time of concentration (TC) = 14.52 min.

++
Process from Point/Station 49.000 to Point/Station 48.000
**** CONFLUENCE OF MINOR STREAMS ****
_____
Along Main Stream number: 1 in normal stream number 1
Stream flow area = 60.000(Ac.)
Runoff from this stream = 70.526(CFS)
Time of concentration = 14.52 min.
Rainfall intensity = 3.974(In/Hr)

++
Process from Point/Station 31.000 to Point/Station 30.000
**** INITIAL AREA EVALUATION ****
_____
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[LOW DENSITY RESIDENTIAL]
(1.0 DU/A or Less)
Impervious value, Ai = 0.100
Sub-Area C Value = 0.270
Initial subarea total flow distance = 80.000(Ft.)
Highest elevation = 2610.000(Ft.)
Lowest elevation = 2609.000(Ft.)
Elevation difference = 1.000(Ft.) Slope = 1.250 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 70.00 (Ft)
for the top area slope value of 1.25 %, in a development type of
1.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration = 11.60 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.2700)*(70.000^.5)/(1.250^(1/3)]= 11.60
The initial area total distance of 80.00 (Ft.) entered leaves a
remaining distance of 10.00 (Ft.)
Using Figure 3-4, the travel time for this distance is 0.25 minutes
for a distance of 10.00 (Ft.) and a slope of 1.25 %
with an elevation difference of 0.13(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
= 0.248 Minutes
Tt=[(11.9*0.0019^3)/(0.13)]^.385= 0.25
Total initial area Ti = 11.60 minutes from Figure 3-3 formula plus
0.25 minutes from the Figure 3-4 formula = 11.85 minutes
Rainfall intensity (I) = 4.530(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.270
Subarea runoff = 0.575(CFS)

Total initial stream area = 0.470(Ac.)

++
Process from Point/Station 30.000 to Point/Station 48.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____
Upstream point/station elevation = 2607.000(Ft.)
Downstream point/station elevation = 2606.000(Ft.)
Pipe length = 100.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 0.575(CFS)
Nearest computed pipe diameter = 9.00(In.)
Calculated individual pipe flow = 0.575(CFS)
Normal flow depth in pipe = 3.66(In.)
Flow top width inside pipe = 8.84(In.)
Critical Depth = 4.12(In.)
Pipe flow velocity = 3.41(Ft/s)
Travel time through pipe = 0.49 min.
Time of concentration (TC) = 12.34 min.

++
Process from Point/Station 30.000 to Point/Station 48.000
**** CONFLUENCE OF MINOR STREAMS ****
_____
Along Main Stream number: 1 in normal stream number 2
Stream flow area = 0.470(Ac.)
Runoff from this stream = 0.575(CFS)
Time of concentration = 12.34 min.
Rainfall intensity = 4.413(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	70.526	14.52	3.974
2	0.575	12.34	4.413

Qmax(1) =
1.000 * 1.000 * 70.526) +
0.900 * 1.000 * 0.575) + = 71.044
Qmax(2) =
1.000 * 0.850 * 70.526) +
1.000 * 1.000 * 0.575) + = 60.522

Total of 2 streams to confluence:
Flow rates before confluence point:
70.526 0.575
Maximum flow rates at confluence using above data:
71.044 60.522
Area of streams before confluence:
60.000 0.470
Results of confluence:
Total flow rate = 71.044(CFS)
Time of concentration = 14.519 min.
Effective stream area after confluence = 60.470(Ac.)

++
Process from Point/Station 48.000 to Point/Station 47.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____
Upstream point/station elevation = 2605.300(Ft.)
Downstream point/station elevation = 2599.000(Ft.)
Pipe length = 100.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 71.044(CFS)
Nearest computed pipe diameter = 27.00(In.)
Calculated individual pipe flow = 71.044(CFS)
Normal flow depth in pipe = 20.30(In.)

Flow top width inside pipe = 23.33(In.)
Critical depth could not be calculated.
Pipe flow velocity = 22.17(Ft/s)
Travel time through pipe = 0.08 min.
Time of concentration (TC) = 14.59 min.

++
Process from Point/Station 47.000 to Point/Station 46.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____
Upstream point/station elevation = 2599.000(Ft.)
Downstream point/station elevation = 2595.900(Ft.)
Pipe length = 75.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 71.044(CFS)
Nearest computed pipe diameter = 30.00(In.)
Calculated individual pipe flow = 71.044(CFS)
Normal flow depth in pipe = 21.28(In.)
Flow top width inside pipe = 27.24(In.)
Critical depth could not be calculated.
Pipe flow velocity = 19.08(Ft/s)
Travel time through pipe = 0.07 min.
Time of concentration (TC) = 14.66 min.

++
Process from Point/Station 47.000 to Point/Station 46.000
**** CONFLUENCE OF MAIN STREAMS ****
_____
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area = 60.470(Ac.)
Runoff from this stream = 71.044(CFS)
Time of concentration = 14.66 min.
Rainfall intensity = 3.949(In/Hr)
Program is now starting with Main Stream No. 2

++
Process from Point/Station 33.000 to Point/Station 29.000
**** INITIAL AREA EVALUATION ****
_____
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[COMMERCIAL area type]
(General Commercial)
Impervious value, Ai = 0.850
Sub-Area C Value = 0.800
Initial subarea total flow distance = 100.000(Ft.)
Highest elevation = 2610.000(Ft.)
Lowest elevation = 2609.000(Ft.)
Elevation difference = 1.000(Ft.) Slope = 1.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 60.00 (Ft)
for the top area slope value of 1.00 %, in a development type of
General Commercial
In Accordance With Figure 3-3
Initial Area Time of Concentration = 4.18 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8000)*(60.000^.5)/(1.000^(1/3)]= 4.18
The initial area total distance of 100.00 (Ft.) entered leaves a
remaining distance of 40.00 (Ft.)
Using Figure 3-4, the travel time for this distance is 0.79 minutes
for a distance of 40.00 (Ft.) and a slope of 1.00 %
with an elevation difference of 0.40(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
= 0.787 Minutes

Tt=[(11.9*0.0076^3)/(0.40)]^.385= 0.79
Total initial area Ti = 4.18 minutes from Figure 3-3 formula plus
0.79 minutes from the Figure 3-4 formula = 4.97 minutes
Calculated TC of 4.970 minutes is less than 5 minutes,
resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) = 7.904(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.800
Subarea runoff = 2.213(CFS)
Total initial stream area = 0.350(Ac.)

++
Process from Point/Station 29.000 to Point/Station 28.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____
Upstream point/station elevation = 2607.000(Ft.)
Downstream point/station elevation = 2597.000(Ft.)
Pipe length = 80.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 2.213(CFS)
Nearest computed pipe diameter = 9.00(In.)
Calculated individual pipe flow = 2.213(CFS)
Normal flow depth in pipe = 3.84(In.)
Flow top width inside pipe = 8.90(In.)
Critical Depth = 8.01(In.)
Pipe flow velocity = 12.32(Ft/s)
Travel time through pipe = 0.11 min.
Time of concentration (TC) = 5.08 min.

++
Process from Point/Station 29.000 to Point/Station 28.000
**** CONFLUENCE OF MINOR STREAMS ****
_____
Along Main Stream number: 2 in normal stream number 1
Stream flow area = 0.350(Ac.)
Runoff from this stream = 2.213(CFS)
Time of concentration = 5.08 min.
Rainfall intensity = 7.825(In/Hr)

++
Process from Point/Station 32.000 to Point/Station 28.000
**** INITIAL AREA EVALUATION ****
_____
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[MEDIUM DENSITY RESIDENTIAL]
(7.3 DU/A or Less)
Impervious value, Ai = 0.400
Sub-Area C Value = 0.480
Initial subarea total flow distance = 225.000(Ft.)
Highest elevation = 2614.800(Ft.)
Lowest elevation = 2605.000(Ft.)
Elevation difference = 9.800(Ft.) Slope = 4.356 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of 4.36 %, in a development type of
7.3 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration = 6.83 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.4800)*(100.000^.5)/(4.356^(1/3)]= 6.83
The initial area total distance of 225.00 (Ft.) entered leaves a
remaining distance of 125.00 (Ft.)
Using Figure 3-4, the travel time for this distance is 1.07 minutes
for a distance of 125.00 (Ft.) and a slope of 4.36 %
with an elevation difference of 5.45(Ft.) from the end of the top area

Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
 = 1.074 Minutes
Tt=[(11.9*0.0237^3)/(5.45)]^.385= 1.07
Total initial area Ti = 6.83 minutes from Figure 3-3 formula plus
 1.07 minutes from the Figure 3-4 formula = 7.91 minutes
Rainfall intensity (I) = 5.881(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.480
Subarea runoff = 1.129(CFS)
Total initial stream area = 0.400(Ac.)

++
Process from Point/Station 32.000 to Point/Station 28.000
**** CONFLUENCE OF MINOR STREAMS ****
_____
Along Main Stream number: 2 in normal stream number 2
Stream flow area = 0.400(Ac.)
Runoff from this stream = 1.129(CFS)
Time of concentration = 7.91 min.
Rainfall intensity = 5.881(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	2.213	5.08	7.825
2	1.129	7.91	5.881

Qmax(1) =
  1.000 * 1.000 * 2.213) +
  1.000 * 0.642 * 1.129) + = 2.938
Qmax(2) =
  0.752 * 1.000 * 2.213) +
  1.000 * 1.000 * 1.129) + = 2.792

Total of 2 streams to confluence:
Flow rates before confluence point:
  2.213 1.129
Maximum flow rates at confluence using above data:
  2.938 2.792
Area of streams before confluence:
  0.350 0.400
Results of confluence:
Total flow rate = 2.938(CFS)
Time of concentration = 5.078 min.
Effective stream area after confluence = 0.750(Ac.)

++
Process from Point/Station 28.000 to Point/Station 46.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____
Upstream point/station elevation = 2597.000(Ft.)
Downstream point/station elevation = 2596.800(Ft.)
Pipe length = 5.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 2.938(CFS)
Nearest computed pipe diameter = 9.00(In.)
Calculated individual pipe flow = 2.938(CFS)
Normal flow depth in pipe = 6.60(In.)
Flow top width inside pipe = 7.96(In.)
Critical depth could not be calculated.
Pipe flow velocity = 8.46(Ft/s)
Travel time through pipe = 0.01 min.
Time of concentration (TC) = 5.09 min.

++
Process from Point/Station 28.000 to Point/Station 46.000
**** CONFLUENCE OF MAIN STREAMS ****

The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area = 0.750(Ac.)
Runoff from this stream = 2.938(CFS)
Time of concentration = 5.09 min.
Rainfall intensity = 7.815(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	71.044	14.66	3.949
2	2.938	5.09	7.815

Qmax(1) =
1.000 * 1.000 * 71.044) +
0.505 * 1.000 * 2.938) + = 72.529
Qmax(2) =
1.000 * 0.347 * 71.044) +
1.000 * 1.000 * 2.938) + = 27.597

Total of 2 main streams to confluence:
Flow rates before confluence point:
71.044 2.938
Maximum flow rates at confluence using above data:
72.529 27.597
Area of streams before confluence:
60.470 0.750

Results of confluence:
Total flow rate = 72.529(CFS)
Time of concentration = 14.660 min.
Effective stream area after confluence = 61.220(Ac.)

++
Process from Point/Station 46.000 to Point/Station 45.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
Upstream point/station elevation = 2595.900(Ft.)
Downstream point/station elevation = 2591.200(Ft.)
Pipe length = 115.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 72.529(CFS)
Nearest computed pipe diameter = 30.00(In.)
Calculated individual pipe flow = 72.529(CFS)
Normal flow depth in pipe = 21.75(In.)
Flow top width inside pipe = 26.79(In.)
Critical depth could not be calculated.
Pipe flow velocity = 19.05(Ft/s)
Travel time through pipe = 0.10 min.
Time of concentration (TC) = 14.76 min.

++
Process from Point/Station 46.000 to Point/Station 45.000
**** CONFLUENCE OF MINOR STREAMS ****
Along Main Stream number: 1 in normal stream number 1
Stream flow area = 61.220(Ac.)
Runoff from this stream = 72.529(CFS)
Time of concentration = 14.76 min.
Rainfall intensity = 3.932(In/Hr)

++
Process from Point/Station 27.000 to Point/Station 26.000
**** INITIAL AREA EVALUATION ****

Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[LOW DENSITY RESIDENTIAL]
(2.0 DU/A or Less)
Impervious value, Ai = 0.200
Sub-Area C Value = 0.340
Initial subarea total flow distance = 120.000(Ft.)
Highest elevation = 2610.000(Ft.)
Lowest elevation = 2600.000(Ft.)
Elevation difference = 10.000(Ft.) Slope = 8.333 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of 8.33 %, in a development type of
2.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration = 6.75 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.3400)*(100.000^.5)/(8.333^(1/3)]= 6.75
The initial area total distance of 120.00 (Ft.) entered leaves a
remaining distance of 20.00 (Ft.)
Using Figure 3-4, the travel time for this distance is 0.20 minutes
for a distance of 20.00 (Ft.) and a slope of 8.33 %
with an elevation difference of 1.67(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
= 0.204 Minutes
Tt=[(11.9*0.0038^3)/(1.67)]^.385= 0.20
Total initial area Ti = 6.75 minutes from Figure 3-3 formula plus
0.20 minutes from the Figure 3-4 formula = 6.95 minutes
Rainfall intensity (I) = 6.391(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.340
Subarea runoff = 0.913(CFS)
Total initial stream area = 0.420(Ac.)

++
Process from Point/Station 26.000 to Point/Station 45.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

Upstream point/station elevation = 2597.000(Ft.)
Downstream point/station elevation = 2591.500(Ft.)
Pipe length = 15.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 0.913(CFS)
Nearest computed pipe diameter = 6.00(In.)
Calculated individual pipe flow = 0.913(CFS)
Normal flow depth in pipe = 2.12(In.)
Flow top width inside pipe = 5.74(In.)
Critical Depth = 5.55(In.)
Pipe flow velocity = 14.67(Ft/s)
Travel time through pipe = 0.02 min.
Time of concentration (TC) = 6.97 min.

++
Process from Point/Station 26.000 to Point/Station 45.000
**** CONFLUENCE OF MINOR STREAMS ****

Along Main Stream number: 1 in normal stream number 2
Stream flow area = 0.420(Ac.)
Runoff from this stream = 0.913(CFS)
Time of concentration = 6.97 min.
Rainfall intensity = 6.381(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)

```
1       72.529     14.76            3.932
2        0.913     6.97             6.381
Qmax(1) =
            1.000 *    1.000 *    72.529) +
            0.616 *    1.000 *     0.913) + =      73.091
Qmax(2) =
            1.000 *    0.472 *    72.529) +
            1.000 *    1.000 *     0.913) + =      35.155

Total of 2 streams to confluence:
Flow rates before confluence point:
     72.529       0.913
Maximum flow rates at confluence using above data:
      73.091       35.155
Area of streams before confluence:
      61.220        0.420
Results of confluence:
Total flow rate =     73.091(CFS)
Time of concentration =    14.761 min.
Effective stream area after confluence =     61.640(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       45.000 to Point/Station       44.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________________
Upstream point/station elevation =  2591.200(Ft.)
Downstream point/station elevation =  2589.300(Ft.)
Pipe length  =    45.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    73.091(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    73.091(CFS)
Normal flow depth in pipe =   21.59(In.)
Flow top width inside pipe =   26.95(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.33(Ft/s)
Travel time through pipe =    0.04 min.
Time of concentration (TC) =    14.80 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       45.000 to Point/Station       44.000
**** CONFLUENCE OF MINOR STREAMS ****
_____________________________________________________________________________
Along Main Stream number: 1 in normal stream number 1
Stream flow area =     61.640(Ac.)
Runoff from this stream =     73.091(CFS)
Time of concentration =   14.80 min.
Rainfall intensity =     3.925(In/Hr)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       22.000 to Point/Station       21.000
**** INITIAL AREA EVALUATION ****
_____________________________________________________________________________
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[COMMERCIAL area type                  ]
(Office Professional    )
Impervious value, Ai = 0.900
Sub-Area C Value = 0.830
Initial subarea total flow distance  =  290.000(Ft.)
Highest elevation = 2610.000(Ft.)
Lowest elevation = 2599.000(Ft.)
Elevation difference =   11.000(Ft.) Slope =  3.793 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
```

The maximum overland flow distance is 80.00 (Ft)
for the top area slope value of 3.79 %, in a development type of
Office Professional
In Accordance With Figure 3-3
Initial Area Time of Concentration = 2.79 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8300)*(80.000^.5)/(3.793^(1/3)]= 2.79
The initial area total distance of 290.00 (Ft.) entered leaves a
remaining distance of 210.00 (Ft.)
Using Figure 3-4, the travel time for this distance is 1.69 minutes
for a distance of 210.00 (Ft.) and a slope of 3.79 %
with an elevation difference of 7.97(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
= 1.690 Minutes
Tt=[(11.9*0.0398^3)/(7.97)]^.385= 1.69
Total initial area Ti = 2.79 minutes from Figure 3-3 formula plus
1.69 minutes from the Figure 3-4 formula = 4.48 minutes
Calculated TC of 4.477 minutes is less than 5 minutes,
resetting TC to 5.0 minutes for rainfall intensity calculations
Rainfall intensity (I) = 7.904(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.830
Subarea runoff = 2.755(CFS)
Total initial stream area = 0.420(Ac.)

++
Process from Point/Station 21.000 to Point/Station 44.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____
Upstream point/station elevation = 2596.000(Ft.)
Downstream point/station elevation = 2589.600(Ft.)
Pipe length = 65.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 2.755(CFS)
Nearest computed pipe diameter = 9.00(In.)
Calculated individual pipe flow = 2.755(CFS)
Normal flow depth in pipe = 4.66(In.)
Flow top width inside pipe = 8.99(In.)
Critical Depth = 8.50(In.)
Pipe flow velocity = 11.93(Ft/s)
Travel time through pipe = 0.09 min.
Time of concentration (TC) = 4.57 min.

++
Process from Point/Station 21.000 to Point/Station 44.000
**** CONFLUENCE OF MINOR STREAMS ****
_____
Along Main Stream number: 1 in normal stream number 2
Stream flow area = 0.420(Ac.)
Runoff from this stream = 2.755(CFS)
Time of concentration = 4.57 min.
Rainfall intensity = 7.904(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	73.091	14.80	3.925
2	2.755	4.57	7.904

Qmax(1) =
1.000 * 1.000 * 73.091) +
0.497 * 1.000 * 2.755) + = 74.459
Qmax(2) =
1.000 * 0.309 * 73.091) +
1.000 * 1.000 * 2.755) + = 25.315

Total of 2 streams to confluence:
Flow rates before confluence point:

```
      73.091       2.755
Maximum flow rates at confluence using above data:
       74.459       25.315
Area of streams before confluence:
       61.640       0.420
Results of confluence:
Total flow rate =     74.459(CFS)
Time of concentration =    14.799 min.
Effective stream area after confluence =     62.060(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       44.000 to Point/Station       43.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =  2589.300(Ft.)
Downstream point/station elevation =  2585.800(Ft.)
Pipe length  =    80.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    74.459(CFS)
Nearest computed pipe diameter  =     30.00(In.)
Calculated individual pipe flow  =    74.459(CFS)
Normal flow depth in pipe =   21.61(In.)
Flow top width inside pipe =   26.93(In.)
Critical depth could not be calculated.
Pipe flow velocity =     19.68(Ft/s)
Travel time through pipe =    0.07 min.
Time of concentration (TC) =    14.87 min.


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       44.000 to Point/Station       43.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     62.060(Ac.)
Runoff from this stream =     74.459(CFS)
Time of concentration =   14.87 min.
Rainfall intensity =     3.914(In/Hr)
Program is now starting with Main Stream No. 2


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       20.000 to Point/Station       19.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[COMMERCIAL area type                  ]
(Office Professional    )
Impervious value, Ai = 0.900
Sub-Area C Value = 0.830
Initial subarea total flow distance  =  430.000(Ft.)
Highest elevation = 2616.000(Ft.)
Lowest elevation = 2598.000(Ft.)
Elevation difference =   18.000(Ft.) Slope =  4.186 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 90.00 (Ft)
for the top area slope value of   4.19 %, in a development type of
 Office Professional
In Accordance With Figure 3-3
Initial Area Time of Concentration =   2.86 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.8300)*(  90.000^.5)/(   4.186^(1/3)]=   2.86
The initial area total distance of  430.00 (Ft.) entered leaves a
remaining distance of  340.00 (Ft.)
Using Figure 3-4, the travel time for this distance is   2.36 minutes
```

for a distance of 340.00 (Ft.) and a slope of 4.19 %
with an elevation difference of 14.23(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
= 2.357 Minutes
Tt=[(11.9*0.0644^3)/(14.23)]^.385= 2.36
Total initial area Ti = 2.86 minutes from Figure 3-3 formula plus
2.36 minutes from the Figure 3-4 formula = 5.22 minutes
Rainfall intensity (I) = 7.689(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.830
Subarea runoff = 7.339(CFS)
Total initial stream area = 1.150(Ac.)

++
Process from Point/Station 19.000 to Point/Station 18.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____
Upstream point/station elevation = 2595.000(Ft.)
Downstream point/station elevation = 2593.000(Ft.)
Pipe length = 20.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 7.339(CFS)
Nearest computed pipe diameter = 12.00(In.)
Calculated individual pipe flow = 7.339(CFS)
Normal flow depth in pipe = 7.05(In.)
Flow top width inside pipe = 11.81(In.)
Critical depth could not be calculated.
Pipe flow velocity = 15.28(Ft/s)
Travel time through pipe = 0.02 min.
Time of concentration (TC) = 5.24 min.

++
Process from Point/Station 19.000 to Point/Station 18.000
**** CONFLUENCE OF MINOR STREAMS ****
_____
Along Main Stream number: 2 in normal stream number 1
Stream flow area = 1.150(Ac.)
Runoff from this stream = 7.339(CFS)
Time of concentration = 5.24 min.
Rainfall intensity = 7.669(In/Hr)

++
Process from Point/Station 18.000 to Point/Station 17.000
**** INITIAL AREA EVALUATION ****
_____
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[UNDISTURBED NATURAL TERRAIN]
(Permanent Open Space)
Impervious value, Ai = 0.000
Sub-Area C Value = 0.200
Initial subarea total flow distance = 70.000(Ft.)
Highest elevation = 2593.000(Ft.)
Lowest elevation = 2592.000(Ft.)
Elevation difference = 1.000(Ft.) Slope = 1.429 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 70.00 (Ft)
for the top area slope value of 1.43 %, in a development type of
Permanent Open Space
In Accordance With Figure 3-3
Initial Area Time of Concentration = 12.03 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.2000)*(70.000^.5)/(1.429^(1/3)]= 12.03
Rainfall intensity (I) = 4.486(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.200
Subarea runoff = 0.099(CFS)

Total initial stream area = 0.110(Ac.)

++
Process from Point/Station 18.000 to Point/Station 17.000
**** CONFLUENCE OF MINOR STREAMS ****
_____
Along Main Stream number: 2 in normal stream number 2
Stream flow area = 0.110(Ac.)
Runoff from this stream = 0.099(CFS)
Time of concentration = 12.03 min.
Rainfall intensity = 4.486(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	7.339	5.24	7.669
2	0.099	12.03	4.486

Qmax(1) =
1.000 * 1.000 * 7.339) +
1.000 * 0.435 * 0.099) + = 7.382
Qmax(2) =
0.585 * 1.000 * 7.339) +
1.000 * 1.000 * 0.099) + = 4.392

Total of 2 streams to confluence:
Flow rates before confluence point:
7.339 0.099
Maximum flow rates at confluence using above data:
7.382 4.392
Area of streams before confluence:
1.150 0.110
Results of confluence:
Total flow rate = 7.382(CFS)
Time of concentration = 5.240 min.
Effective stream area after confluence = 1.260(Ac.)

++
Process from Point/Station 17.000 to Point/Station 16.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____
Upstream point/station elevation = 2588.500(Ft.)
Downstream point/station elevation = 2587.500(Ft.)
Pipe length = 25.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 7.382(CFS)
Nearest computed pipe diameter = 15.00(In.)
Calculated individual pipe flow = 7.382(CFS)
Normal flow depth in pipe = 8.12(In.)
Flow top width inside pipe = 14.95(In.)
Critical Depth = 13.00(In.)
Pipe flow velocity = 10.88(Ft/s)
Travel time through pipe = 0.04 min.
Time of concentration (TC) = 5.28 min.

++
Process from Point/Station 17.000 to Point/Station 16.000
**** CONFLUENCE OF MINOR STREAMS ****
_____
Along Main Stream number: 2 in normal stream number 1
Stream flow area = 1.260(Ac.)
Runoff from this stream = 7.382(CFS)
Time of concentration = 5.28 min.
Rainfall intensity = 7.633(In/Hr)

++
Process from Point/Station 70.000 to Point/Station 16.000
**** INITIAL AREA EVALUATION ****
_____
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[LOW DENSITY RESIDENTIAL]
(1.0 DU/A or Less)
Impervious value, Ai = 0.100
Sub-Area C Value = 0.270
Initial subarea total flow distance = 900.000(Ft.)
Highest elevation = 2662.000(Ft.)
Lowest elevation = 2591.000(Ft.)
Elevation difference = 71.000(Ft.) Slope = 7.889 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of 7.89 %, in a development type of
1.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration = 7.50 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.2700)*(100.000^.5)/(7.889^(1/3)]= 7.50
The initial area total distance of 900.00 (Ft.) entered leaves a
remaining distance of 800.00 (Ft.)
Using Figure 3-4, the travel time for this distance is 3.57 minutes
for a distance of 800.00 (Ft.) and a slope of 7.89 %
with an elevation difference of 63.11(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
= 3.570 Minutes
Tt=[(11.9*0.1515^3)/(63.11)]^.385= 3.57
Total initial area Ti = 7.50 minutes from Figure 3-3 formula plus
3.57 minutes from the Figure 3-4 formula = 11.07 minutes
Rainfall intensity (I) = 4.733(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.270
Subarea runoff = 12.778(CFS)
Total initial stream area = 10.000(Ac.)

++
Process from Point/Station 70.000 to Point/Station 16.000
**** CONFLUENCE OF MINOR STREAMS ****
_____
Along Main Stream number: 2 in normal stream number 2
Stream flow area = 10.000(Ac.)
Runoff from this stream = 12.778(CFS)
Time of concentration = 11.07 min.
Rainfall intensity = 4.733(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	7.382	5.28	7.633
2	12.778	11.07	4.733

Qmax(1) =
1.000 * 1.000 * 7.382) +
1.000 * 0.477 * 12.778) + = 13.473
Qmax(2) =
0.620 * 1.000 * 7.382) +
1.000 * 1.000 * 12.778) + = 17.356

Total of 2 streams to confluence:
Flow rates before confluence point:
7.382 12.778
Maximum flow rates at confluence using above data:
13.473 17.356

Area of streams before confluence:
1.260 10.000
Results of confluence:
Total flow rate = 17.356(CFS)
Time of concentration = 11.074 min.
Effective stream area after confluence = 11.260(Ac.)

++
Process from Point/Station 16.000 to Point/Station 15.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____
Upstream point/station elevation = 2587.500(Ft.)
Downstream point/station elevation = 2586.200(Ft.)
Pipe length = 105.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 17.356(CFS)
Nearest computed pipe diameter = 21.00(In.)
Calculated individual pipe flow = 17.356(CFS)
Normal flow depth in pipe = 16.92(In.)
Flow top width inside pipe = 16.61(In.)
Critical Depth = 18.29(In.)
Pipe flow velocity = 8.36(Ft/s)
Travel time through pipe = 0.21 min.
Time of concentration (TC) = 11.28 min.

++
Process from Point/Station 16.000 to Point/Station 15.000
**** CONFLUENCE OF MINOR STREAMS ****
_____
Along Main Stream number: 2 in normal stream number 1
Stream flow area = 11.260(Ac.)
Runoff from this stream = 17.356(CFS)
Time of concentration = 11.28 min.
Rainfall intensity = 4.676(In/Hr)

++
Process from Point/Station 24.000 to Point/Station 15.000
**** INITIAL AREA EVALUATION ****
_____
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[HIGH DENSITY RESIDENTIAL]
(24.0 DU/A or Less)
Impervious value, Ai = 0.650
Sub-Area C Value = 0.660
Initial subarea total flow distance = 250.000(Ft.)
Highest elevation = 2606.000(Ft.)
Lowest elevation = 2591.000(Ft.)
Elevation difference = 15.000(Ft.) Slope = 6.000 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 95.00 (Ft)
for the top area slope value of 6.00 %, in a development type of
24.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration = 4.25 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.6600)*(95.000^.5)/(6.000^(1/3)]= 4.25
The initial area total distance of 250.00 (Ft.) entered leaves a
remaining distance of 155.00 (Ft.)
Using Figure 3-4, the travel time for this distance is 1.12 minutes
for a distance of 155.00 (Ft.) and a slope of 6.00 %
with an elevation difference of 9.30(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
= 1.121 Minutes
Tt=[(11.9*0.0294^3)/(9.30)]^.385= 1.12

Total initial area Ti = 4.25 minutes from Figure 3-3 formula plus
1.12 minutes from the Figure 3-4 formula = 5.37 minutes
Rainfall intensity (I) = 7.549(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.660
Subarea runoff = 1.644(CFS)
Total initial stream area = 0.330(Ac.)

++
Process from Point/Station 24.000 to Point/Station 15.000
**** CONFLUENCE OF MINOR STREAMS ****
_____
Along Main Stream number: 2 in normal stream number 2
Stream flow area = 0.330(Ac.)
Runoff from this stream = 1.644(CFS)
Time of concentration = 5.37 min.
Rainfall intensity = 7.549(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	17.356	11.28	4.676
2	1.644	5.37	7.549

Qmax(1) =
1.000 * 1.000 * 17.356) +
0.619 * 1.000 * 1.644) + = 18.374
Qmax(2) =
1.000 * 0.476 * 17.356) +
1.000 * 1.000 * 1.644) + = 9.902

Total of 2 streams to confluence:
Flow rates before confluence point:
17.356 1.644
Maximum flow rates at confluence using above data:
18.374 9.902
Area of streams before confluence:
11.260 0.330
Results of confluence:
Total flow rate = 18.374(CFS)
Time of concentration = 11.284 min.
Effective stream area after confluence = 11.590(Ac.)

++
Process from Point/Station 15.000 to Point/Station 43.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____
Upstream point/station elevation = 2586.200(Ft.)
Downstream point/station elevation = 2585.800(Ft.)
Pipe length = 40.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 18.374(CFS)
Nearest computed pipe diameter = 24.00(In.)
Calculated individual pipe flow = 18.374(CFS)
Normal flow depth in pipe = 16.43(In.)
Flow top width inside pipe = 22.30(In.)
Critical Depth = 18.51(In.)
Pipe flow velocity = 8.02(Ft/s)
Travel time through pipe = 0.08 min.
Time of concentration (TC) = 11.37 min.

++
Process from Point/Station 15.000 to Point/Station 43.000
**** CONFLUENCE OF MAIN STREAMS ****
_____
The following data inside Main Stream is listed:
In Main Stream number: 2

Stream flow area = 11.590(Ac.)
Runoff from this stream = 18.374(CFS)
Time of concentration = 11.37 min.
Rainfall intensity = 4.654(In/Hr)
Program is now starting with Main Stream No. 3

++
Process from Point/Station 60.000 to Point/Station 43.000
**** INITIAL AREA EVALUATION ****
_____
Decimal fraction soil group A = 0.500
Decimal fraction soil group B = 0.500
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
[LOW DENSITY RESIDENTIAL]
(1.0 DU/A or Less)
Impervious value, Ai = 0.100
Sub-Area C Value = 0.295
Initial subarea total flow distance = 1200.000(Ft.)
Highest elevation = 2700.000(Ft.)
Lowest elevation = 2591.000(Ft.)
Elevation difference = 109.000(Ft.) Slope = 9.083 %
INITIAL AREA TIME OF CONCENTRATION CALCULATIONS:
The maximum overland flow distance is 100.00 (Ft)
for the top area slope value of 9.08 %, in a development type of
1.0 DU/A or Less
In Accordance With Figure 3-3
Initial Area Time of Concentration = 6.94 minutes
TC = [1.8*(1.1-C)*distance(Ft.)^.5)/(% slope^(1/3)]
TC = [1.8*(1.1-0.2950)*(100.000^.5)/(9.083^(1/3)]= 6.94
The initial area total distance of 1200.00 (Ft.) entered leaves a
remaining distance of 1100.00 (Ft.)
Using Figure 3-4, the travel time for this distance is 4.32 minutes
for a distance of 1100.00 (Ft.) and a slope of 9.08 %
with an elevation difference of 99.91(Ft.) from the end of the top area
Tt = [11.9*length(Mi)^3)/(elevation change(Ft.))]^.385 *60(min/hr)
= 4.321 Minutes
Tt=[(11.9*0.2083^3)/(99.91)]^.385= 4.32
Total initial area Ti = 6.94 minutes from Figure 3-3 formula plus
4.32 minutes from the Figure 3-4 formula = 11.27 minutes
Rainfall intensity (I) = 4.681(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.295
Subarea runoff = 19.332(CFS)
Total initial stream area = 14.000(Ac.)

++
Process from Point/Station 60.000 to Point/Station 43.000
**** CONFLUENCE OF MAIN STREAMS ****
_____
The following data inside Main Stream is listed:
In Main Stream number: 3
Stream flow area = 14.000(Ac.)
Runoff from this stream = 19.332(CFS)
Time of concentration = 11.27 min.
Rainfall intensity = 4.681(In/Hr)
Summary of stream data:

Stream No.	Flow rate (CFS)	TC (min)	Rainfall Intensity (In/Hr)
1	74.459	14.87	3.914
2	18.374	11.37	4.654
3	19.332	11.27	4.681

Qmax(1) =
1.000 * 1.000 * 74.459) +
0.841 * 1.000 * 18.374) +

```
            0.836 *   1.000 *   19.332) + =     106.077
Qmax(2) =
            1.000 *   0.765 *   74.459) +
            1.000 *   1.000 *   18.374) +
            0.994 *   1.000 *   19.332) + =      94.524
Qmax(3) =
            1.000 *   0.758 *   74.459) +
            1.000 *   0.991 *   18.374) +
            1.000 *   1.000 *   19.332) + =      93.962

Total of 3 main streams to confluence:
Flow rates before confluence point:
     74.459      18.374      19.332
Maximum flow rates at confluence using above data:
     106.077       94.524       93.962
Area of streams before confluence:
      62.060       11.590       14.000


Results of confluence:
Total flow rate =    106.077(CFS)
Time of concentration =    14.867 min.
Effective stream area after confluence  =     87.650(Ac.)


++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
Process from Point/Station       43.000 to Point/Station       42.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
_____________________________________________________________________________
Upstream point/station elevation =  2585.800(Ft.)
Downstream point/station elevation =  2583.200(Ft.)
Pipe length  =    45.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =   106.077(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =   106.077(CFS)
Normal flow depth in pipe =   23.04(In.)
Flow top width inside pipe =   30.30(In.)
Critical depth could not be calculated.
Pipe flow velocity =     23.95(Ft/s)
Travel time through pipe =    0.03 min.
Time of concentration (TC) =    14.90 min.
End of computations, total study area =          87.650 (Ac.)
```